



April 27, 2015

Mr. James Johnson
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

Subject: Data Deliverable Package 10
West Lake Landfill Site, Bridgeton, Missouri
CERCLIS ID: MOD079900932
EPA Region 7, START 4, Contract No. EP-S7-13-06, Task Order No. 0058
Task Monitor: James Johnson, On-Scene Coordinator

Dear Mr. Johnson:

Tetra Tech, Inc. is submitting the following analytical laboratory reports with associated data validation reports for sampling at locations off-site of the West Lake Landfill Site in Bridgeton, Missouri.

<u>Sample Delivery Group</u>	<u>Analysis Type</u>	<u>Sample Collection Date</u>
J10545	Alpha-emitting Ra and Isotopic U/Th	02/11/2015
J10616	Alpha-emitting Ra and Isotopic U/Th	02/18/2015
J10707	Alpha-emitting Ra and Isotopic U/Th	02/25/2015
J10788	Gamma scan and gross alpha/beta	03/04/2015
J10788	Alpha-emitting Ra and Isotopic U/Th	03/04/2015
J10908	Gamma scan and gross alpha/beta	03/13/2015
J10908	Alpha-emitting Ra and Isotopic U/Th	03/13/2015
J11120	Gamma scan and gross alpha/beta	03/27/2015
J11233	Gamma scan and gross alpha/beta	04/03/2015
60188508	Volatile Organic Compounds	02/20/2015
60189050	Volatile Organic Compounds	02/27/2015
60189577	Volatile Organic Compounds	03/06/2015
60190027	Volatile Organic Compounds	03/13/2015
60191132	Volatile Organic Compounds	03/27/2015
P1500832	Hydrogen Sulfide	02/27/2015
P1500900	Hydrogen Sulfide	03/06/2015
P1501117	Hydrogen Sulfide	03/13/2015
P1501192	Hydrogen Sulfide	03/20/2015
P1501359	Hydrogen Sulfide	03/27/2015

Mr. James Johnson
April 27, 2015
Page 2

If you have any questions or comments, please contact Rob Monnig at (816) 412-1775.

Sincerely,



for Dave Kinroth
START Project Manager



Ted Faile, PG, CHMM
START Program Manager

Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J10545

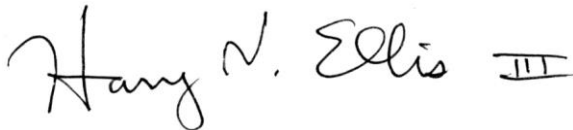
Sample Numbers: WAA-01-AF-PS-20150211, WAA-02-AF-PS-20150211, WAA-03-AF-PS-20150211, WAA-04-AF-PS-20150211, WAA-05-AF-PS-20150211, and WAA-00-AF-FB-20150211

Matrix / Number of Samples: 5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10545 included five (5) environmental air (filter) samples and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and uranium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) and field blanks yielded low activities for one (of three) thorium isotopes but none of the three uranium isotopes. No qualifications were applied. The field blank yielded a low activity for total alpha radium activity. A similar activity was seen in one field sample, but the other field sample results were nondetected. The radium result for field sample WAA-05-AF-PS-20150211 was qualified as nondetected due to media contamination and flagged “U” to indicate that.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a “carrier” or “tracer”, whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory’s QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits (“RL”). These extrapolations should be qualified as estimated (flagged “J”).

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10545-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher



Authorized for release by:
3/23/2015 9:31:26 AM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

LINKS

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results through

TotalAccess

Have a Question?



Visit us at:

www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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9

10

11

12

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	14
QC Association Summary	17
Tracer Carrier Summary	18



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Job ID: 160-10545-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10545-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 2/19/2015 9:30 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150211 (160-10545-1), WAA-02-AF-PS-20150211 (160-10545-2), WAA-03-AF-PS-20150211 (160-10545-3), WAA-04-AF-PS-20150211 (160-10545-4), WAA-05-AF-PS-20150211 (160-10545-5) and WAA-00-AF-FB-20150211 (160-10545-6) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 03/02/2015 and analyzed on 03/05/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Job ID: 160-10545-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150211 (160-10545-1), WAA-02-AF-PS-20150211 (160-10545-2), WAA-03-AF-PS-20150211 (160-10545-3), WAA-04-AF-PS-20150211 (160-10545-4), WAA-05-AF-PS-20150211 (160-10545-5) and WAA-00-AF-FB-20150211 (160-10545-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/03/2015 and analyzed on 03/10/2015 and 03/11/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)


Samples WAA-01-AF-PS-20150211 (160-10545-1), WAA-02-AF-PS-20150211 (160-10545-2), WAA-03-AF-PS-20150211 (160-10545-3), WAA-04-AF-PS-20150211 (160-10545-4), WAA-05-AF-PS-20150211 (160-10545-5) and WAA-00-AF-FB-20150211 (160-10545-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/03/2015 and analyzed on 03/10/2015 and 03/11/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Chain of Custody Record

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager: Dave Kinroth		Site Contact: Dave Kinroth		Date: 2-16-15		COC No:											
Tetra Tech, Inc.		Tel/Fax: 314-517-6798		Lab Contact: Mike Franks		Carrier: NA		1 of 1 COCs											
415 Oak Street		Analysis Turnaround Time						Sampler:											
Kansas City, MO 64106		<input type="checkbox"/> CALENDAR DAYS <input checked="" type="checkbox"/> WORKING DAYS						For Lab Use Only:											
(816) 412-1786 Phone		TAT if different from Below 20						Walk-in Client:											
(816) 816-410-1748 FAX		<input type="checkbox"/> 2 weeks						Lab Sampling:											
Project Name: West Lake Landfill Site		<input type="checkbox"/> 1 week						Job / SDG No.:											
Site: Bridgeton, MO		<input type="checkbox"/> 2 days																	
P O # 1105610		<input type="checkbox"/> 1 day																	
Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:					
WAA-01-AF-PS-20150211	2/11/15	11:14	Filter	Air	1		X	X	X	X	X	X	X	* 9315 Radium-226 (GFPC)					
WAA-02-AF-PS-20150211	2/11/15	10:14	Filter	Air	1		X	X	X	X	X	X	X	contingent upon TAR results					
WAA-03-AF-PS-20150211	2/11/15	10:44	Filter	Air	1		X	X	X	X	X	X	X	for all samples					
WAA-04-AF-PS-20150211	2/11/15	10:58	Filter	Air	1		X	X	X	X	X	X	X						
WAA-05-AF-PS-20150211	2/11/15	10:30	Filter	Air	1		X	X	X	X	X	X	X						
WAA-00-AF-FB-20150211	2/11/15	NA	Filter	Air	1		X	X	X	X	X	X	X						
														 160-10545 Chain of Custody					
Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= Other																			
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.														Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)					
<input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown														<input type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months					
Special Instructions/QC Requirements & Comments:																			
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No				Custody Seal No.:				Cooler Temp. (°C): Obs'd: _____				Therm ID No.:							
Relinquished by: <i>Tanya Barlow</i>				Company: Tetra Tech				Date/Time: 2/19/15 0930				Received by: <i>[Signature]</i>							
Relinquished by:				Company:				Date/Time:				Received by:							
Relinquished by:				Company:				Date/Time:				Received in Laboratory by:							

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10545-1

Login Number: 10545

List Source: TestAmerica St. Louis

List Number: 1

Creator: Daniels, Brian J

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Method	Method Description	Protocol	Laboratory
9315	Total Alpha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10545-1

Project/Site: West Lake Landfill - Filters

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10545-1	WAA-01-AF-PS-20150211	Filter	02/11/15 11:14	02/19/15 09:30
160-10545-2	WAA-02-AF-PS-20150211	Filter	02/11/15 10:14	02/19/15 09:30
160-10545-3	WAA-03-AF-PS-20150211	Filter	02/11/15 10:44	02/19/15 09:30
160-10545-4	WAA-04-AF-PS-20150211	Filter	02/11/15 10:58	02/19/15 09:30
160-10545-5	WAA-05-AF-PS-20150211	Filter	02/11/15 10:30	02/19/15 09:30
160-10545-6	WAA-00-AF-FB-20150211	Filter	02/11/15 00:00	02/19/15 09:30

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Client Sample ID: WAA-01-AF-PS-20150211

Lab Sample ID: 160-10545-1

Date Collected: 02/11/15 11:14

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.444	U	0.470	0.472	1.00	0.761	pCi/Sample	03/02/15 09:17	03/05/15 18:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	82.0		40 - 110					03/02/15 09:17	03/05/15 18:12	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.241	U	0.163	0.164	1.00	0.207	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-230	0.218	U	0.131	0.133	1.00	0.104	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-232	0.0218	U	0.0574	0.0574	1.00	0.123	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	91.0		30 - 110					03/03/15 14:27	03/10/15 11:24	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.115	U	0.142	0.142	1.00	0.233	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	0.0969	U	0.108	0.108	1.00	0.153	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.0389	U	0.0930	0.0931	1.00	0.181	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.6		30 - 110					03/03/15 14:27	03/10/15 11:22	1

Client Sample ID: WAA-02-AF-PS-20150211

Lab Sample ID: 160-10545-2

Date Collected: 02/11/15 10:14

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.288	U	0.447	0.448	1.00	0.760	pCi/Sample	03/02/15 09:17	03/05/15 18:12	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					03/02/15 09:17	03/05/15 18:12	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.139	U	0.156	0.157	1.00	0.252	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-230	0.162	U	0.119	0.120	1.00	0.135	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-232	0.0760	U	0.0844	0.0846	1.00	0.120	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1

HUG

20 April 2015

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Client Sample ID: WAA-02-AF-PS-20150211

Lab Sample ID: 160-10545-2

Date Collected: 02/11/15 10:14

Matrix: Filter

Date Received: 02/19/15 09:30

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	92.2		30 - 110	03/03/15 14:27	03/10/15 11:24	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0727	U	0.118	0.119	1.00	0.209	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	0.0413	U	0.0886	0.0887	1.00	0.174	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.101	U	0.105	0.105	1.00	0.153	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	88.8		30 - 110	03/03/15 14:27	03/10/15 11:22	1

Client Sample ID: WAA-03-AF-PS-20150211

Lab Sample ID: 160-10545-3

Date Collected: 02/11/15 10:44

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.182	U	0.396	0.397	1.00	0.697	pCi/Sample	03/02/15 09:17	03/05/15 18:12	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110	03/02/15 09:17	03/05/15 18:12	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.171	U	0.159	0.160	1.00	0.242	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-230	0.222	U	0.137	0.138	1.00	0.137	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-232	0.0658	U	0.0750	0.0752	1.00	0.101	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	93.3		30 - 110	03/03/15 14:27	03/10/15 11:24	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0970	U	0.111	0.111	1.00	0.171	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	0.0982	U	0.0982	0.0985	1.00	0.0736	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.0541	U	0.0837	0.0838	1.00	0.145	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	87.5		30 - 110	03/03/15 14:27	03/10/15 11:22	1

HUG 20 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Client Sample ID: WAA-04-AF-PS-20150211

Lab Sample ID: 160-10545-4

Date Collected: 02/11/15 10:58

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.0619	U	0.347	0.348	1.00	0.695	pCi/Sample	03/02/15 09:17	03/05/15 18:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	93.8		40 - 110					03/02/15 09:17	03/05/15 18:39	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.148	U	0.166	0.167	1.00	0.266	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-230	0.288	J	0.159	0.161	1.00	0.133	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-232	0.0320	U	0.0596	0.0596	1.00	0.112	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	84.5		30 - 110					03/03/15 14:27	03/10/15 11:24	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.232	J	0.139	0.141	1.00	0.125	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	0.0138	U	0.0514	0.0514	1.00	0.131	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.0602	U	0.0793	0.0795	1.00	0.125	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.1		30 - 110					03/03/15 14:27	03/10/15 11:22	1

Client Sample ID: WAA-05-AF-PS-20150211

Lab Sample ID: 160-10545-5

Date Collected: 02/11/15 10:30

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.973	U	0.536	0.543	1.00	0.726	pCi/Sample	03/02/15 09:17	03/05/15 18:40	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	101		40 - 110					03/02/15 09:17	03/05/15 18:40	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.164	U	0.139	0.139	1.00	0.192	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-230	0.227	J	0.147	0.148	1.00	0.164	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Thorium-232	0.0708	U	0.0887	0.0889	1.00	0.139	pCi/Sample	03/03/15 14:27	03/10/15 11:24	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	90.4		30 - 110					03/03/15 14:27	03/10/15 11:24	1

HVE 20 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Client Sample ID: WAA-05-AF-PS-20150211

Lab Sample ID: 160-10545-5

Date Collected: 02/11/15 10:30

Matrix: Filter

Date Received: 02/19/15 09:30

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0403	U	0.0680	0.0681	1.00	0.122	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Uranium-235/236	0.0231	U	0.0462	0.0463	1.00	0.0694	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Uranium-238	0.0216	U	0.0568	0.0569	1.00	0.122	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	94.4		30 - 110					03/03/15 14:27	03/11/15 09:14	1

Client Sample ID: WAA-00-AF-FB-20150211

Lab Sample ID: 160-10545-6

Date Collected: 02/11/15 00:00

Matrix: Filter

Date Received: 02/19/15 09:30

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.644	J	0.419	0.423	1.00	0.599	pCi/Sample	03/02/15 09:17	03/05/15 18:40	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110					03/02/15 09:17	03/05/15 18:40	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.0184	U	0.128	0.128	1.00	0.259	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Thorium-230	0.272	J	0.151	0.153	1.00	0.127	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Thorium-232	0.0529	U	0.0819	0.0820	1.00	0.142	pCi/Sample	03/03/15 14:27	03/11/15 09:14	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	88.7		30 - 110					03/03/15 14:27	03/11/15 09:14	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0483	U	0.0949	0.0950	1.00	0.177	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	-0.0100	U	0.0200	0.0200	1.00	0.133	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.0883	U	0.0876	0.0880	1.00	0.106	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.6		30 - 110					03/03/15 14:27	03/10/15 11:22	1

HUG
20 Apr 15

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-176803/1-A

Matrix: Filter

Analysis Batch: 177959

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 176803

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.1944	U	0.303	0.303	1.00	0.516	pCi/Sample	03/02/15 09:17	03/10/15 18:03	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	96.8		40 - 110					03/02/15 09:17	03/10/15 18:03	1

Lab Sample ID: LCS 160-176803/2-A

Matrix: Filter

Analysis Batch: 177959

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 176803

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Total Alpha Radium	44.9	60.32		5.93	1.00	0.511	pCi/Samp	134	65 - 150	
Carrier	LCS %Yield	LCS Qualifier	Limits							
Ba Carrier	96.2		40 - 110							

Lab Sample ID: LCSD 160-176803/3-A

Matrix: Filter

Analysis Batch: 177959

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 176803

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium	44.9	61.18		6.01	1.00	0.592	pCi/Samp	136	65 - 150	0.07	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	94.4		40 - 110								

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-177090/1-A

Matrix: Filter

Analysis Batch: 178262

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177090

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.03162	U	0.0959	0.0960	1.00	0.193	pCi/Sample	03/03/15 14:27	03/10/15 11:23	1
Thorium-230	0.3680		0.175	0.177	1.00	0.140	pCi/Sample	03/03/15 14:27	03/10/15 11:23	1
Thorium-232	0.006297	U	0.0620	0.0620	1.00	0.152	pCi/Sample	03/03/15 14:27	03/10/15 11:23	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	92.9		30 - 110					03/03/15 14:27	03/10/15 11:23	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-177090/2-A

Matrix: Filter

Analysis Batch: 178263

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177090

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	16.1	16.21		1.76	1.00	0.177	pCi/Samp	101	81 - 118

Tracer	LCS %Yield	LCS Qualifier	Limits
Thorium-229	91.1		30 - 110

Lab Sample ID: LCSD 160-177090/3-A

Matrix: Filter

Analysis Batch: 178265

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 177090

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	16.1	16.60		1.79	1.00	0.104	pCi/Samp	103	81 - 118	0.11	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Thorium-229	90.6		30 - 110

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-177093/1-A

Matrix: Filter

Analysis Batch: 178249

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177093

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.1680	U	0.135	0.135	1.00	0.179	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-235/236	0.03645	U	0.0679	0.0680	1.00	0.127	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1
Uranium-238	0.09540	U	0.0930	0.0934	1.00	0.121	pCi/Sample	03/03/15 14:27	03/10/15 11:22	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	89.3		30 - 110	03/03/15 14:27	03/10/15 11:22	1

Lab Sample ID: LCS 160-177093/2-A

Matrix: Filter

Analysis Batch: 178250

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177093

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Uranium-233/234	25.5	23.20		2.37	1.00	0.127	pCi/Samp	91	84 - 120
Uranium-238	26.0	23.44		2.38	1.00	0.0579	pCi/Samp	90	82 - 122

Tracer	LCS %Yield	LCS Qualifier	Limits
Uranium-232	91.3		30 - 110

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-177093/3-A
Matrix: Filter
Analysis Batch: 178252

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 177093

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234	25.5	24.88		2.52	1.00	0.111	pCi/Samp	98	84 - 120	0.34	1
Uranium-238	26.0	24.46		2.49	1.00	0.162	pCi/Samp	94	82 - 122	0.21	1
Tracer	LCSD %Yield	LCSD Qualifier	Limits								
Uranium-232	83.8		30 - 110								

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Rad

Prep Batch: 176803

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10545-1	WAA-01-AF-PS-20150211	Total/NA	Filter	DPS-0	
160-10545-2	WAA-02-AF-PS-20150211	Total/NA	Filter	DPS-0	
160-10545-3	WAA-03-AF-PS-20150211	Total/NA	Filter	DPS-0	
160-10545-4	WAA-04-AF-PS-20150211	Total/NA	Filter	DPS-0	
160-10545-5	WAA-05-AF-PS-20150211	Total/NA	Filter	DPS-0	
160-10545-6	WAA-00-AF-FB-20150211	Total/NA	Filter	DPS-0	
LCS 160-176803/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-176803/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-176803/1-A	Method Blank	Total/NA	Filter	DPS-0	

Prep Batch: 177090

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10545-1	WAA-01-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-2	WAA-02-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-3	WAA-03-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-4	WAA-04-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-5	WAA-05-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-6	WAA-00-AF-FB-20150211	Total/NA	Filter	ExtChrom	
LCS 160-177090/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177090/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177090/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 177093

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10545-1	WAA-01-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-2	WAA-02-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-3	WAA-03-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-4	WAA-04-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-5	WAA-05-AF-PS-20150211	Total/NA	Filter	ExtChrom	
160-10545-6	WAA-00-AF-FB-20150211	Total/NA	Filter	ExtChrom	
LCS 160-177093/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177093/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177093/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10545-1

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Ba (40-110)					
160-10545-1	WAA-01-AF-PS-20150211	82.0					
160-10545-2	WAA-02-AF-PS-20150211	101					
160-10545-3	WAA-03-AF-PS-20150211	103					
160-10545-4	WAA-04-AF-PS-20150211	93.8					
160-10545-5	WAA-05-AF-PS-20150211	101					
160-10545-6	WAA-00-AF-FB-20150211	104					
LCS 160-176803/2-A	Lab Control Sample	96.2					
LCSD 160-176803/3-A	Lab Control Sample Dup	94.4					
MB 160-176803/1-A	Method Blank	96.8					
Tracer/Carrier Legend							
Ba = Ba Carrier							

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Th-229 (30-110)					
160-10545-1	WAA-01-AF-PS-20150211	91.0					
160-10545-2	WAA-02-AF-PS-20150211	92.2					
160-10545-3	WAA-03-AF-PS-20150211	93.3					
160-10545-4	WAA-04-AF-PS-20150211	84.5					
160-10545-5	WAA-05-AF-PS-20150211	90.4					
160-10545-6	WAA-00-AF-FB-20150211	88.7					
LCS 160-177090/2-A	Lab Control Sample	91.1					
LCSD 160-177090/3-A	Lab Control Sample Dup	90.6					
MB 160-177090/1-A	Method Blank	92.9					
Tracer/Carrier Legend							
Th-229 = Thorium-229							

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	U-232 (30-110)					
160-10545-1	WAA-01-AF-PS-20150211	92.6					
160-10545-2	WAA-02-AF-PS-20150211	88.8					
160-10545-3	WAA-03-AF-PS-20150211	87.5					
160-10545-4	WAA-04-AF-PS-20150211	92.1					
160-10545-5	WAA-05-AF-PS-20150211	94.4					
160-10545-6	WAA-00-AF-FB-20150211	89.6					
LCS 160-177093/2-A	Lab Control Sample	91.3					
LCSD 160-177093/3-A	Lab Control Sample Dup	83.8					
MB 160-177093/1-A	Method Blank	89.3					
Tracer/Carrier Legend							
U-232 = Uranium-232							

TestAmerica St. Louis

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J10616

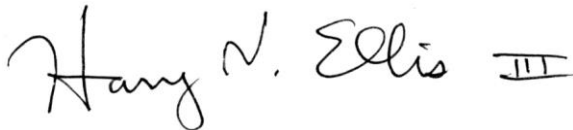
Sample Numbers: WAA-01-AF-PS-20150218, WAA-02-AF-PS-20150218, WAA-03-AF-PS-20150218, WAA-04-AF-PS-20150218, WAA-05-AF-PS-20150218, and WAA-00-AF-FB-20150218

Matrix / Number of Samples: 5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10616 included five (5) environmental air (filter) samples and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and uranium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low activities for one (of three) thorium isotopes and one (of three) uranium isotopes. The field blank yielded low activities for those two isotopes and one other uranium isotope. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a “carrier” or “tracer”, whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory’s QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits (“RL”). These extrapolations should be qualified as estimated (flagged “J”).

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10616-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:

3/24/2015 1:49:45 PM

Elizabeth Hoerchler, Project Mgmt. Assistant
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Designee for

Erika Gish, Project Manager II
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erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	14
QC Association Summary	17
Tracer Carrier Summary	18



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Job ID: 160-10616-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10616-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 02/23/2015; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 18.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5) and WAA-00-AF-FB-20150218 (160-10616-6) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 03/03/2015 and analyzed on 03/06/2015.

Prep batch 176964

The following samples are filters that were split between multiple analyses: WAA-00-AF-FB-20150218 (160-10616-6), WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5). Insufficient sample volume was available to perform a sample duplicate (DUP). A LCS/LCSD was performed instead of a sample duplicate.

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Job ID: 160-10616-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5) and WAA-00-AF-FB-20150218 (160-10616-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/03/2015 and analyzed on 03/11/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP) associated with batch 177088. The samples are filters that must be split between multiple analysis. A LCS/LCSD was performed instead of a sample duplicate. WAA-00-AF-FB-20150218 (160-10616-6), WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5) and WAA-00-AF-FB-20150218 (160-10616-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/03/2015 and analyzed on 03/11/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP) associated with batch 177089. The samples are filters that must be split between multiple analysis. A LCS/LCSD was performed instead of a sample duplicate. WAA-00-AF-FB-20150218 (160-10616-6), WAA-01-AF-PS-20150218 (160-10616-1), WAA-02-AF-PS-20150218 (160-10616-2), WAA-03-AF-PS-20150218 (160-10616-3), WAA-04-AF-PS-20150218 (160-10616-4), WAA-05-AF-PS-20150218 (160-10616-5)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10616-1

Login Number: 10616

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Method	Method Description	Protocol	Laboratory
9315	Total Alpha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10616-1

Project/Site: West Lake Landfill - Filters

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10616-1	WAA-01-AF-PS-20150218	Filter	02/18/15 12:20	02/23/15 10:40
160-10616-2	WAA-02-AF-PS-20150218	Filter	02/18/15 13:05	02/23/15 10:40
160-10616-3	WAA-03-AF-PS-20150218	Filter	02/18/15 12:40	02/23/15 10:40
160-10616-4	WAA-04-AF-PS-20150218	Filter	02/18/15 12:55	02/23/15 10:40
160-10616-5	WAA-05-AF-PS-20150218	Filter	02/18/15 13:15	02/23/15 10:40
160-10616-6	WAA-00-AF-FB-20150218	Filter	02/18/15 00:00	02/23/15 10:40

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Client Sample ID: WAA-01-AF-PS-20150218

Lab Sample ID: 160-10616-1

Date Collected: 02/18/15 12:20

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.139	U	0.386	0.386	1.00	0.779	pCi/Sample	03/03/15 11:45	03/06/15 07:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110					03/03/15 11:45	03/06/15 07:30	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.109	U	0.133	0.133	1.00	0.217	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.394	J	0.172	0.176	1.00	0.101	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	0.102	J	0.0907	0.0911	1.00	0.101	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	96.6		30 - 110					03/03/15 14:20	03/11/15 09:19	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0898	U	0.139	0.140	1.00	0.242	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	-0.0314	U	0.0866	0.0867	1.00	0.239	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	-0.124	U	0.0998	0.100	1.00	0.285	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	88.7		30 - 110					03/03/15 14:20	03/11/15 09:16	1

Client Sample ID: WAA-02-AF-PS-20150218

Lab Sample ID: 160-10616-2

Date Collected: 02/18/15 13:05

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.0648	U	0.346	0.346	1.00	0.700	pCi/Sample	03/03/15 11:45	03/06/15 07:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					03/03/15 11:45	03/06/15 07:30	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.255	J	0.179	0.180	1.00	0.245	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.161	J	0.119	0.120	1.00	0.136	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	0.0577	U	0.0760	0.0761	1.00	0.120	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1

AUG 20 April 2015

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Client Sample ID: WAA-02-AF-PS-20150218

Lab Sample ID: 160-10616-2

Date Collected: 02/18/15 13:05

Matrix: Filter

Date Received: 02/23/15 10:40

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	88.9		30 - 110	03/03/15 14:20	03/11/15 09:19	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.371	J	0.177	0.180	1.00	0.166	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	0.0675	J	0.0780	0.0782	1.00	0.0675	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.660	J	0.220	0.227	1.00	0.0998	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	95.1		30 - 110	03/03/15 14:20	03/11/15 09:16	1

Client Sample ID: WAA-03-AF-PS-20150218

Lab Sample ID: 160-10616-3

Date Collected: 02/18/15 12:40

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.563	U	0.414	0.417	1.00	0.602	pCi/Sample	03/03/15 11:45	03/06/15 07:30	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110	03/03/15 11:45	03/06/15 07:30	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.122	U	0.158	0.158	1.00	0.263	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.315	J	0.157	0.159	1.00	0.120	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	0.0472	U	0.0652	0.0653	1.00	0.101	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	90.6		30 - 110	03/03/15 14:20	03/11/15 09:19	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.245	J	0.155	0.157	1.00	0.181	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	0.130	J	0.116	0.116	1.00	0.129	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.238	J	0.142	0.144	1.00	0.138	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	91.6		30 - 110	03/03/15 14:20	03/11/15 09:16	1

HUG 24 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Client Sample ID: WAA-04-AF-PS-20150218

Lab Sample ID: 160-10616-4

Date Collected: 02/18/15 12:55

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.578	J	0.395	0.399	1.00	0.551	pCi/Sample	03/03/15 11:45	03/06/15 07:30	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110					03/03/15 11:45	03/06/15 07:30	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.178	u	0.154	0.155	1.00	0.225	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.500	J	0.203	0.207	1.00	0.160	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	0.0139	u	0.0586	0.0587	1.00	0.136	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	93.9		30 - 110					03/03/15 14:20	03/11/15 09:19	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0969	u	0.0945	0.0948	1.00	0.123	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	0.0136	u	0.0505	0.0506	1.00	0.129	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.0935	J	0.0837	0.0840	1.00	0.0561	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.3		30 - 110					03/03/15 14:20	03/11/15 09:16	1

Client Sample ID: WAA-05-AF-PS-20150218

Lab Sample ID: 160-10616-5

Date Collected: 02/18/15 13:15

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.0970	u	0.440	0.440	1.00	0.802	pCi/Sample	03/03/15 11:45	03/06/15 07:31	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110					03/03/15 11:45	03/06/15 07:31	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.196	J	0.145	0.145	1.00	0.187	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.382	J	0.186	0.189	1.00	0.187	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	-0.00917	u	0.0640	0.0640	1.00	0.169	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	89.7		30 - 110					03/03/15 14:20	03/11/15 09:19	1

14UG 20 Apr 18

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Client Sample ID: WAA-05-AF-PS-20150218

Lab Sample ID: 160-10616-5

Date Collected: 02/18/15 13:15

Matrix: Filter

Date Received: 02/23/15 10:40

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0968	U	0.110	0.111	1.00	0.170	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	-0.0102	U	0.0204	0.0204	1.00	0.135	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.00655	U	0.0645	0.0645	1.00	0.158	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	85.8		30 - 110					03/03/15 14:20	03/11/15 09:16	1

Client Sample ID: WAA-00-AF-FB-20150218

Lab Sample ID: 160-10616-6

Date Collected: 02/18/15 00:00

Matrix: Filter

Date Received: 02/23/15 10:40

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.189	U	0.421	0.421	1.00	0.743	pCi/Sample	03/03/15 11:45	03/06/15 07:31	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	104		40 - 110					03/03/15 11:45	03/06/15 07:31	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.153	U	0.145	0.145	1.00	0.215	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-230	0.412	U	0.180	0.183	1.00	0.0586	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Thorium-232	0.0389	U	0.0550	0.0551	1.00	0.0583	pCi/Sample	03/03/15 14:20	03/11/15 09:19	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	90.4		30 - 110					03/03/15 14:20	03/11/15 09:19	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.220	U	0.142	0.143	1.00	0.160	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	0.0172	U	0.0729	0.0729	1.00	0.169	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.132	U	0.106	0.107	1.00	0.121	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.1		30 - 110					03/03/15 14:20	03/11/15 09:16	1

HUG
20 Apr 15

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-176964/1-A

Matrix: Filter

Analysis Batch: 177607

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 176964

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.1507	U	0.366	0.366	1.00	0.757	pCi/Sample	03/03/15 11:45	03/06/15 07:30	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	95.9		40 - 110					03/03/15 11:45	03/06/15 07:30	1

Lab Sample ID: LCS 160-176964/2-A

Matrix: Filter

Analysis Batch: 177607

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 176964

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Total Alpha Radium	44.9	43.11		4.62	1.00	0.831	pCi/Samp	96	65 - 150	
Carrier	LCS %Yield	LCS Qualifier	Limits							
Ba Carrier	97.6		40 - 110							

Lab Sample ID: LCSD 160-176964/3-A

Matrix: Filter

Analysis Batch: 177607

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 176964

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium	44.9	40.43		4.39	1.00	0.755	pCi/Samp	90	65 - 150	0.30	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	97.1		40 - 110								

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-177088/1-A

Matrix: Filter

Analysis Batch: 178821

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177088

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.1412	U	0.159	0.160	1.00	0.257	pCi/Sample	03/03/15 14:20	03/11/15 09:18	1
Thorium-230	0.2272		0.140	0.141	1.00	0.138	pCi/Sample	03/03/15 14:20	03/11/15 09:18	1
Thorium-232	0.06236	U	0.0771	0.0773	1.00	0.115	pCi/Sample	03/03/15 14:20	03/11/15 09:18	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	91.6		30 - 110					03/03/15 14:20	03/11/15 09:18	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-177088/2-A

Matrix: Filter

Analysis Batch: 178822

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177088

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	16.1	16.36		1.77	1.00	0.173	pCi/Samp	102	81 - 118

Tracer	LCS %Yield	LCS Qualifier	Limits
Thorium-229	90.5		30 - 110

Lab Sample ID: LCSD 160-177088/3-A

Matrix: Filter

Analysis Batch: 178823

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 177088

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	16.1	17.18		1.83	1.00	0.101	pCi/Samp	107	81 - 118	0.23	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Thorium-229	93.8		30 - 110

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-177089/1-A

Matrix: Filter

Analysis Batch: 178809

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177089

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.09688		0.0867	0.0870	1.00	0.0581	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-235/236	-0.04019	U	0.0402	0.0403	1.00	0.194	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Uranium-238	0.04190	U	0.0708	0.0708	1.00	0.127	pCi/Sample	03/03/15 14:20	03/11/15 09:16	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.4		30 - 110					03/03/15 14:20	03/11/15 09:16	1

Lab Sample ID: LCS 160-177089/2-A

Matrix: Filter

Analysis Batch: 178811

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177089

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Uranium-233/234	25.5	25.11		2.54	1.00	0.217	pCi/Samp	99	84 - 120
Uranium-238	26.0	24.81		2.51	1.00	0.146	pCi/Samp	95	82 - 122

Tracer	LCS %Yield	LCS Qualifier	Limits
Uranium-232	88.6		30 - 110

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-177089/3-A
Matrix: Filter
Analysis Batch: 178812

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 177089

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234	25.5	24.60		2.52	1.00	0.156	pCi/Samp	97	84 - 120	0.10	1
Uranium-238	26.0	25.78		2.62	1.00	0.139	pCi/Samp	99	82 - 122	0.19	1
Tracer	LCSD %Yield	LCSD Qualifier	Limits								
Uranium-232	80.5		30 - 110								

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Rad

Prep Batch: 176964

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10616-1	WAA-01-AF-PS-20150218	Total/NA	Filter	DPS-0	
160-10616-2	WAA-02-AF-PS-20150218	Total/NA	Filter	DPS-0	
160-10616-3	WAA-03-AF-PS-20150218	Total/NA	Filter	DPS-0	
160-10616-4	WAA-04-AF-PS-20150218	Total/NA	Filter	DPS-0	
160-10616-5	WAA-05-AF-PS-20150218	Total/NA	Filter	DPS-0	
160-10616-6	WAA-00-AF-FB-20150218	Total/NA	Filter	DPS-0	
LCS 160-176964/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-176964/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-176964/1-A	Method Blank	Total/NA	Filter	DPS-0	

Prep Batch: 177088

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10616-1	WAA-01-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-2	WAA-02-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-3	WAA-03-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-4	WAA-04-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-5	WAA-05-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-6	WAA-00-AF-FB-20150218	Total/NA	Filter	ExtChrom	
LCS 160-177088/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177088/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177088/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 177089

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10616-1	WAA-01-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-2	WAA-02-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-3	WAA-03-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-4	WAA-04-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-5	WAA-05-AF-PS-20150218	Total/NA	Filter	ExtChrom	
160-10616-6	WAA-00-AF-FB-20150218	Total/NA	Filter	ExtChrom	
LCS 160-177089/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177089/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177089/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10616-1

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Ba (40-110)					
160-10616-1	WAA-01-AF-PS-20150218	106					
160-10616-2	WAA-02-AF-PS-20150218	103					
160-10616-3	WAA-03-AF-PS-20150218	104					
160-10616-4	WAA-04-AF-PS-20150218	104					
160-10616-5	WAA-05-AF-PS-20150218	104					
160-10616-6	WAA-00-AF-FB-20150218	104					
LCS 160-176964/2-A	Lab Control Sample	97.6					
LCSD 160-176964/3-A	Lab Control Sample Dup	97.1					
MB 160-176964/1-A	Method Blank	95.9					
Tracer/Carrier Legend							
Ba = Ba Carrier							

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Th-229 (30-110)					
160-10616-1	WAA-01-AF-PS-20150218	96.6					
160-10616-2	WAA-02-AF-PS-20150218	88.9					
160-10616-3	WAA-03-AF-PS-20150218	90.6					
160-10616-4	WAA-04-AF-PS-20150218	93.9					
160-10616-5	WAA-05-AF-PS-20150218	89.7					
160-10616-6	WAA-00-AF-FB-20150218	90.4					
LCS 160-177088/2-A	Lab Control Sample	90.5					
LCSD 160-177088/3-A	Lab Control Sample Dup	93.8					
MB 160-177088/1-A	Method Blank	91.6					
Tracer/Carrier Legend							
Th-229 = Thorium-229							

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	U-232 (30-110)					
160-10616-1	WAA-01-AF-PS-20150218	88.7					
160-10616-2	WAA-02-AF-PS-20150218	95.1					
160-10616-3	WAA-03-AF-PS-20150218	91.6					
160-10616-4	WAA-04-AF-PS-20150218	92.3					
160-10616-5	WAA-05-AF-PS-20150218	85.8					
160-10616-6	WAA-00-AF-FB-20150218	92.1					
LCS 160-177089/2-A	Lab Control Sample	88.6					
LCSD 160-177089/3-A	Lab Control Sample Dup	80.5					
MB 160-177089/1-A	Method Blank	89.4					
Tracer/Carrier Legend							
U-232 = Uranium-232							

TestAmerica St. Louis

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J10707

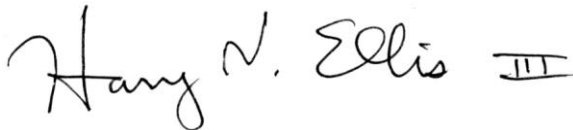
Sample Numbers: WAA-01-AF-PS-20150225, WAA-02-AF-PS-20150225, WAA-03-AF-PS-20150225, WAA-04-AF-PS-20150225, WAA-05-AF-PS-20150225, and WAA-00-AF-FB-20150225

Matrix / Number of Samples: 5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10707 included five (5) environmental air (filter) samples and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and uranium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low activities for one (of three) thorium isotopes and for none (of three) uranium isotopes. The field blank yielded low activities for that isotope and one uranium isotope. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a “carrier” or “tracer”, whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory’s QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits (“RL”). These extrapolations should be qualified as estimated (flagged “J”). In the total alpha radium analysis, low sample volumes and high background counts led to some samples (including all laboratory QC samples) yielding minimum detectable concentrations above the reporting limit. No qualifications were applied for this, but data users should note that these results are not fully comparable with those from other sampling events.

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10707-2

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher



Authorized for release by:
3/31/2015 11:30:35 AM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1

2

3

4

5

6

7

8

9

10

11

12

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	14
QC Association Summary	17
Tracer Carrier Summary	18



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Job ID: 160-10707-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10707-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 3/2/2015 10:35 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150225 (160-10707-1), WAA-02-AF-PS-20150225 (160-10707-2), WAA-03-AF-PS-20150225 (160-10707-3), WAA-04-AF-PS-20150225 (160-10707-4), WAA-05-AF-PS-20150225 (160-10707-5) and WAA-00-AF-FB-20150225 (160-10707-6) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 03/11/2015 and analyzed on 03/12/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

The detection goal was not met for the following samples due to a reduced aliquot which can be attributed to the matrix of the sample (filter): (MB 160-178637/1-A), WAA-02-AF-PS-20150225 (160-10707-2). Samples are filters that were digested in order to split between

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Job ID: 160-10707-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

multiple analyses. Analytical results are reported with the detection limit achieved.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150225 (160-10707-1), WAA-02-AF-PS-20150225 (160-10707-2), WAA-03-AF-PS-20150225 (160-10707-3), WAA-04-AF-PS-20150225 (160-10707-4), WAA-05-AF-PS-20150225 (160-10707-5) and WAA-00-AF-FB-20150225 (160-10707-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/09/2015 and analyzed on 03/16/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150225 (160-10707-1), WAA-02-AF-PS-20150225 (160-10707-2), WAA-03-AF-PS-20150225 (160-10707-3), WAA-04-AF-PS-20150225 (160-10707-4), WAA-05-AF-PS-20150225 (160-10707-5) and WAA-00-AF-FB-20150225 (160-10707-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/09/2015 and analyzed on 03/16/2015.

Insufficient sample volume was available to perform a sample duplicate (DUP). The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Earth City, MO 63045
phone 314.298.8566 fax

Chain of Custody Record

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:[illegible]

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10707-2

Login Number: 10707

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Method	Method Description	Protocol	Laboratory
9315	Total Alpha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10707-2

Project/Site: West Lake Landfill - Filters

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10707-1	WAA-01-AF-PS-20150225	Filter	02/25/15 11:06	03/02/15 10:35
160-10707-2	WAA-02-AF-PS-20150225	Filter	02/25/15 10:18	03/02/15 10:35
160-10707-3	WAA-03-AF-PS-20150225	Filter	02/25/15 10:42	03/02/15 10:35
160-10707-4	WAA-04-AF-PS-20150225	Filter	02/25/15 10:53	03/02/15 10:35
160-10707-5	WAA-05-AF-PS-20150225	Filter	02/25/15 10:30	03/02/15 10:35
160-10707-6	WAA-00-AF-FB-20150225	Filter	02/25/15 00:00	03/02/15 10:35

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Client Sample ID: WAA-01-AF-PS-20150225

Lab Sample ID: 160-10707-1

Date Collected: 02/25/15 11:06

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.480	U	0.586	0.587	1.00	0.969	pCi/Sample	03/11/15 11:29	03/12/15 18:40	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110					03/11/15 11:29	03/12/15 18:40	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.162	U	0.144	0.145	1.00	0.212	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.133	U	0.112	0.113	1.00	0.145	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.0179	U	0.0358	0.0359	1.00	0.0538	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	95.3		30 - 110					03/09/15 14:16	03/16/15 20:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0668	U	0.0837	0.0839	1.00	0.131	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	0.0222	U	0.0443	0.0444	1.00	0.0665	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.0563	U	0.0741	0.0743	1.00	0.117	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	95.0		30 - 110					03/09/15 14:16	03/16/15 20:13	1

Client Sample ID: WAA-02-AF-PS-20150225

Lab Sample ID: 160-10707-2

Date Collected: 02/25/15 10:18

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	-0.0708	U	0.600	0.600	1.00	1.14	pCi/Sample	03/11/15 11:29	03/12/15 18:40	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	103		40 - 110					03/11/15 11:29	03/12/15 18:40	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.104	U	0.151	0.151	1.00	0.258	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.181	U	0.120	0.121	1.00	0.104	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.0375	U	0.0530	0.0531	1.00	0.0562	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1

HVE 20 April 2015

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Client Sample ID: WAA-02-AF-PS-20150225

Lab Sample ID: 160-10707-2

Date Collected: 02/25/15 10:18

Matrix: Filter

Date Received: 03/02/15 10:35

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	91.4		30 - 110	03/09/15 14:16	03/16/15 20:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.144	J	0.108	0.109	1.00	0.105	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	-0.00981	U J	0.0196	0.0196	1.00	0.130	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.105	J	0.0939	0.0943	1.00	0.104	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	93.2		30 - 110	03/09/15 14:16	03/16/15 20:13	1

Client Sample ID: WAA-03-AF-PS-20150225

Lab Sample ID: 160-10707-3

Date Collected: 02/25/15 10:42

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.372	U	0.485	0.487	1.00	0.811	pCi/Sample	03/11/15 11:29	03/12/15 18:49	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110	03/11/15 11:29	03/12/15 18:49	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.0375	U	0.131	0.131	1.00	0.252	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.342	J	0.159	0.162	1.00	0.0996	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.203	J	0.133	0.134	1.00	0.144	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	97.8		30 - 110	03/09/15 14:16	03/16/15 20:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.123	U	0.107	0.107	1.00	0.135	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	-0.0190	U	0.0268	0.0268	1.00	0.150	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.0730	U	0.121	0.122	1.00	0.214	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	95.4		30 - 110	03/09/15 14:16	03/16/15 20:13	1

HUG 20 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Client Sample ID: WAA-04-AF-PS-20150225

Lab Sample ID: 160-10707-4

Date Collected: 02/25/15 10:53

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.0971	U	0.407	0.407	1.00	0.776	pCi/Sample	03/11/15 11:29	03/12/15 18:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	100		40 - 110					03/11/15 11:29	03/12/15 18:49	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.193	U	0.156	0.157	1.00	0.222	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.303	U	0.152	0.154	1.00	0.101	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.0288	U	0.0537	0.0537	1.00	0.101	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	96.2		30 - 110					03/09/15 14:16	03/16/15 20:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0716	U	0.0897	0.0899	1.00	0.141	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	0.000	U	0.0198	0.0198	1.00	0.0713	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.0333	U	0.0715	0.0716	1.00	0.141	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.7		30 - 110					03/09/15 14:16	03/16/15 20:13	1

Client Sample ID: WAA-05-AF-PS-20150225

Lab Sample ID: 160-10707-5

Date Collected: 02/25/15 10:30

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.338	U	0.568	0.569	1.00	0.980	pCi/Sample	03/11/15 11:29	03/12/15 18:49	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.9		40 - 110					03/11/15 11:29	03/12/15 18:49	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.123	U	0.157	0.157	1.00	0.261	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.544	U	0.205	0.210	1.00	0.105	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.151	U	0.107	0.108	1.00	0.0567	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	91.6		30 - 110					03/09/15 14:16	03/16/15 20:10	1

HVE 20 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Client Sample ID: WAA-05-AF-PS-20150225

Lab Sample ID: 160-10707-5

Date Collected: 02/25/15 10:30

Matrix: Filter

Date Received: 03/02/15 10:35

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Uranium-233/234	0.0138	U	0.0582	0.0583	1.00	0.135	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	-0.00951	U	0.0190	0.0190	1.00	0.126	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.131	J	0.106	0.106	1.00	0.120	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Tracer										
	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	96.0		30 - 110					03/09/15 14:16	03/16/15 20:13	1

Client Sample ID: WAA-00-AF-FB-20150225

Lab Sample ID: 160-10707-6

Date Collected: 02/25/15 00:00

Matrix: Filter

Date Received: 03/02/15 10:35

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Total Alpha Radium	0.363	U	0.474	0.475	1.00	0.791	pCi/Sample	03/11/15 11:29	03/12/15 18:49	1
Carrier										
	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	106		40 - 110					03/11/15 11:29	03/12/15 18:49	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium-228	0.0626	U	0.115	0.116	1.00	0.209	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.325	J	0.154	0.157	1.00	0.0550	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.0213	U	0.0559	0.0559	1.00	0.120	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Tracer										
	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	93.1		30 - 110					03/09/15 14:16	03/16/15 20:10	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Uranium-233/234	0.0377	U	0.0869	0.0869	1.00	0.170	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	0.000	U	0.0204	0.0204	1.00	0.0735	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.138	J	0.104	0.105	1.00	0.0589	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Tracer										
	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	86.5		30 - 110					03/09/15 14:16	03/16/15 20:13	1

HUG 20 Apr 15

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-178637/1-A

Matrix: Filter

Analysis Batch: 178893

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 178637

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.1773	U G	0.569	0.569	1.00	1.02	pCi/Sample	03/11/15 11:29	03/12/15 18:39	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					03/11/15 11:29	03/12/15 18:39	1

Lab Sample ID: LCS 160-178637/2-A

Matrix: Filter

Analysis Batch: 178893

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 178637

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Total Alpha Radium	44.7	44.27		4.97	1.00	1.16	pCi/Samp	99	65 - 150	
Carrier	LCS %Yield	LCS Qualifier	Limits							
Ba Carrier	93.8		40 - 110							

Lab Sample ID: LCSD 160-178637/3-A

Matrix: Filter

Analysis Batch: 178893

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 178637

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium	44.7	43.40		4.92	1.00	1.20	pCi/Samp	97	65 - 150	0.09	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	90.3		40 - 110								

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-177795/1-A

Matrix: Filter

Analysis Batch: 179856

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177795

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.06301	U	0.118	0.118	1.00	0.213	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-230	0.2844		0.147	0.148	1.00	0.116	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Thorium-232	0.02772	U	0.0516	0.0517	1.00	0.0968	pCi/Sample	03/09/15 14:16	03/16/15 20:10	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	99.5		30 - 110					03/09/15 14:16	03/16/15 20:10	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-177795/2-A

Matrix: Filter

Analysis Batch: 179857

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177795

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	16.1	15.83		1.72	1.00	0.122	pCi/Samp	99	81 - 118
Tracer	LCS %Yield	LCS Qualifier	Limits						
Thorium-229	93.3		30 - 110						

Lab Sample ID: LCSD 160-177795/3-A

Matrix: Filter

Analysis Batch: 179858

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 177795

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	16.1	16.59		1.79	1.00	0.125	pCi/Samp	103	81 - 118	0.22	1
Tracer	LCSD %Yield	LCSD Qualifier	Limits								
Thorium-229	89.7		30 - 110								

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-177797/1-A

Matrix: Filter

Analysis Batch: 179871

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 177797

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.09303	U	0.100	0.100	1.00	0.144	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-235/236	0.03859	U	0.0719	0.0719	1.00	0.135	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Uranium-238	0.05375	U	0.0831	0.0832	1.00	0.144	pCi/Sample	03/09/15 14:16	03/16/15 20:13	1
Tracer	MB %Yield	MB Qualifier	Limits							
Uranium-232	87.6		30 - 110							
								Prepared	Analyzed	Dil Fac
								03/09/15 14:16	03/16/15 20:13	1

Lab Sample ID: LCS 160-177797/2-A

Matrix: Filter

Analysis Batch: 179872

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 177797

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Uranium-233/234	25.5	26.13		2.62	1.00	0.128	pCi/Samp	103	84 - 120
Uranium-238	26.0	26.53		2.65	1.00	0.0583	pCi/Samp	102	82 - 122
Tracer	LCS %Yield	LCS Qualifier	Limits						
Uranium-232	88.1		30 - 110						

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-177797/3-A

Matrix: Filter

Analysis Batch: 179873

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 177797

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234	25.5	23.92		2.43	1.00	0.166	pCi/Samp	94	84 - 120	0.44	1
Uranium-238	26.0	25.46		2.56	1.00	0.141	pCi/Samp	98	82 - 122	0.20	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Uranium-232	89.0		30 - 110

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Rad

Prep Batch: 177795

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10707-1	WAA-01-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-2	WAA-02-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-3	WAA-03-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-4	WAA-04-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-5	WAA-05-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-6	WAA-00-AF-FB-20150225	Total/NA	Filter	ExtChrom	
LCS 160-177795/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177795/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177795/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 177797

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10707-1	WAA-01-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-2	WAA-02-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-3	WAA-03-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-4	WAA-04-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-5	WAA-05-AF-PS-20150225	Total/NA	Filter	ExtChrom	
160-10707-6	WAA-00-AF-FB-20150225	Total/NA	Filter	ExtChrom	
LCS 160-177797/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-177797/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-177797/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 178637

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10707-1	WAA-01-AF-PS-20150225	Total/NA	Filter	DPS-0	
160-10707-2	WAA-02-AF-PS-20150225	Total/NA	Filter	DPS-0	
160-10707-3	WAA-03-AF-PS-20150225	Total/NA	Filter	DPS-0	
160-10707-4	WAA-04-AF-PS-20150225	Total/NA	Filter	DPS-0	
160-10707-5	WAA-05-AF-PS-20150225	Total/NA	Filter	DPS-0	
160-10707-6	WAA-00-AF-FB-20150225	Total/NA	Filter	DPS-0	
LCS 160-178637/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-178637/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-178637/1-A	Method Blank	Total/NA	Filter	DPS-0	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10707-2

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Ba (40-110)					
160-10707-1	WAA-01-AF-PS-20150225	106					
160-10707-2	WAA-02-AF-PS-20150225	103					
160-10707-3	WAA-03-AF-PS-20150225	106					
160-10707-4	WAA-04-AF-PS-20150225	100					
160-10707-5	WAA-05-AF-PS-20150225	97.9					
160-10707-6	WAA-00-AF-FB-20150225	106					
LCS 160-178637/2-A	Lab Control Sample	93.8					
LCSD 160-178637/3-A	Lab Control Sample Dup	90.3					
MB 160-178637/1-A	Method Blank	102					
Tracer/Carrier Legend							
Ba = Ba Carrier							

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Th-229 (30-110)					
160-10707-1	WAA-01-AF-PS-20150225	95.3					
160-10707-2	WAA-02-AF-PS-20150225	91.4					
160-10707-3	WAA-03-AF-PS-20150225	97.8					
160-10707-4	WAA-04-AF-PS-20150225	96.2					
160-10707-5	WAA-05-AF-PS-20150225	91.6					
160-10707-6	WAA-00-AF-FB-20150225	93.1					
LCS 160-177795/2-A	Lab Control Sample	93.3					
LCSD 160-177795/3-A	Lab Control Sample Dup	89.7					
MB 160-177795/1-A	Method Blank	99.5					
Tracer/Carrier Legend							
Th-229 = Thorium-229							

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	U-232 (30-110)					
160-10707-1	WAA-01-AF-PS-20150225	95.0					
160-10707-2	WAA-02-AF-PS-20150225	93.2					
160-10707-3	WAA-03-AF-PS-20150225	95.4					
160-10707-4	WAA-04-AF-PS-20150225	92.7					
160-10707-5	WAA-05-AF-PS-20150225	96.0					
160-10707-6	WAA-00-AF-FB-20150225	86.5					
LCS 160-177797/2-A	Lab Control Sample	88.1					
LCSD 160-177797/3-A	Lab Control Sample Dup	89.0					
MB 160-177797/1-A	Method Blank	87.6					
Tracer/Carrier Legend							
U-232 = Uranium-232							

TestAmerica St. Louis

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 9, 2015

Sample Delivery Group (SDG): J10788

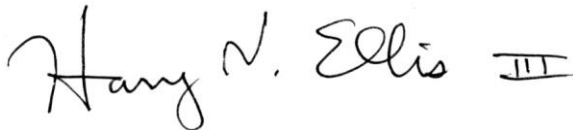
Sample Numbers: WAA-01-AF-PS-20150304, WAA-02-AF-PS-20150304, WAA-03-AF-PS-20150304, WAA-04-AF-PS-20150304, WAA-05-AF-PS-20150304, and WAA-00-AF-FB-20150304

Matrix / Number of Samples: 5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



9 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10788 included five (5) environmental air (filter) samples and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The other field samples yielded more than 5 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10788-2

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher



Authorized for release by:
3/20/2015 10:59:44 AM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1

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4

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6

7

8

9

10

11

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	13
QC Association Summary	15



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Job ID: 160-10788-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10788-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup
Method 3620C: Florisil Cleanup
Method 3630C: Silica Gel Cleanup
Method 3640A: Gel-Permeation Cleanup
Method 3650B: Acid-Base Partition Cleanup
Method 3660B: Sulfur Cleanup
Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Job ID: 160-10788-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

RECEIPT

The samples were received on 3/9/2015 10:25 AM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5) and WAA-00-AF-FB-20150304 (160-10788-6) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared and analyzed on 03/10/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5) and WAA-00-AF-FB-20150304 (160-10788-6) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared on 03/10/2015 and analyzed on 03/10/2015 and 03/11/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10788-2

Login Number: 10788

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10788-2

Project/Site: West Lake Landfill - Filters

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10788-2

Project/Site: West Lake Landfill - Filters

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10788-1	WAA-01-AF-PS-20150304	Filter	03/04/15 11:15	03/09/15 10:25
160-10788-2	WAA-02-AF-PS-20150304	Filter	03/04/15 10:24	03/09/15 10:25
160-10788-3	WAA-03-AF-PS-20150304	Filter	03/04/15 11:04	03/09/15 10:25
160-10788-4	WAA-04-AF-PS-20150304	Filter	03/04/15 10:53	03/09/15 10:25
160-10788-5	WAA-05-AF-PS-20150304	Filter	03/04/15 10:36	03/09/15 10:25
160-10788-6	WAA-00-AF-FB-20150304	Filter	03/04/15 00:00	03/09/15 10:25

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Client Sample ID: WAA-01-AF-PS-20150304

Lab Sample ID: 160-10788-1

Date Collected: 03/04/15 11:15

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.638	U	0.320	0.328	10.0	0.368	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1
Gross Beta	16.9		1.15	2.05	10.0	0.422	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-3.38	U	18.1	18.1	20.0	14.0	pCi/Sample	03/10/15 12:59	03/11/15 07:44	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/11/15 07:44	1

Client Sample ID: WAA-02-AF-PS-20150304

Lab Sample ID: 160-10788-2

Date Collected: 03/04/15 10:24

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.304	U	0.243	0.245	10.0	0.339	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1
Gross Beta	14.0		1.06	1.75	10.0	0.414	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.00644	U	5.02	5.02	20.0	9.39	pCi/Sample	03/10/15 12:59	03/10/15 21:45	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/10/15 21:45	1

Client Sample ID: WAA-03-AF-PS-20150304

Lab Sample ID: 160-10788-3

Date Collected: 03/04/15 11:04

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.384	U	0.290	0.293	10.0	0.414	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1
Gross Beta	16.3		1.13	1.98	10.0	0.406	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1

HVE 9 April 2015

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Client Sample ID: WAA-03-AF-PS-20150304

Lab Sample ID: 160-10788-3

Date Collected: 03/04/15 11:04

Matrix: Filter

Date Received: 03/09/15 10:25

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.0678	U	5.11	5.11	20.0	9.75	pCi/Sample	03/10/15 12:59	03/10/15 21:43	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/10/15 21:43	1

Client Sample ID: WAA-04-AF-PS-20150304

Lab Sample ID: 160-10788-4

Date Collected: 03/04/15 10:53

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.475	J	0.275	0.280	10.0	0.327	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1
Gross Beta	13.6		1.04	1.71	10.0	0.378	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.545	U	5.54	5.54	20.0	10.5	pCi/Sample	03/10/15 12:59	03/10/15 21:44	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Be-7	129		52.8	54.4		47.4	pCi/Sample	03/10/15 12:59	03/10/15 21:44	1

Client Sample ID: WAA-05-AF-PS-20150304

Lab Sample ID: 160-10788-5

Date Collected: 03/04/15 10:36

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.374	J	0.237	0.241	10.0	0.277	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1
Gross Beta	13.7		1.06	1.73	10.0	0.401	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.569	U	6.10	6.10	20.0	11.1	pCi/Sample	03/10/15 12:59	03/10/15 21:45	1

HUG 9 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Client Sample ID: WAA-05-AF-PS-20150304

Lab Sample ID: 160-10788-5

Date Collected: 03/04/15 10:36

Matrix: Filter

Date Received: 03/09/15 10:25

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/10/15 21:45	1

Client Sample ID: WAA-00-AF-FB-20150304

Lab Sample ID: 160-10788-6

Date Collected: 03/04/15 00:00

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.126	U	0.209	0.210	10.0	0.368	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1
Gross Beta	1.71		0.422	0.455	10.0	0.422	pCi/Sample	03/10/15 12:57	03/10/15 18:42	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.111	U	4.24	4.24	20.0	8.01	pCi/Sample	03/10/15 12:59	03/10/15 22:52	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/10/15 22:52	1

HUG
9 Apr 15

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-178118/1-A

Matrix: Filter

Analysis Batch: 177956

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 178118

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	-0.04461	U	0.185	0.185	10.0	0.410	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1
Gross Beta	0.2815	U	0.264	0.266	10.0	0.418	pCi/Sample	03/10/15 12:57	03/10/15 17:26	1

Lab Sample ID: LCS 160-178118/2-A

Matrix: Filter

Analysis Batch: 177956

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 178118

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.36	6.217		1.11	10.0	0.327	pCi/Samp	116	75 - 125

Lab Sample ID: LCSB 160-178118/3-A

Matrix: Filter

Analysis Batch: 177956

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 178118

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	18.92		2.26	10.0	0.401	pCi/Samp	106	75 - 125

Lab Sample ID: 160-10788-1 DU

Matrix: Filter

Analysis Batch: 177956

Client Sample ID: WAA-01-AF-PS-20150304

Prep Type: Total/NA

Prep Batch: 178118

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.638		0.6048		0.335	10.0	0.410	pCi/Samp	0.05	1
Gross Beta	16.9		15.49		1.91	10.0	0.418	pCi/Samp	0.36	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-178125/1-A

Matrix: Filter

Analysis Batch: 178120

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 178125

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.3507	U	4.45	4.45	20.0	8.44	pCi/Sample	03/10/15 12:59	03/10/15 21:46	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/10/15 12:59	03/10/15 21:46	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-178125/2-A
Matrix: Filter
Analysis Batch: 178121

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 178125

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	31200		3240		113	pCi/Samp	98	87 - 116
Cesium-137	11100	10720		1130	20.0	66.7	pCi/Samp	97	87 - 120
Cobalt-60	11600	11250		1140		39.3	pCi/Samp	97	87 - 115

Lab Sample ID: 160-10788-1 DU
Matrix: Filter
Analysis Batch: 178130

Client Sample ID: WAA-01-AF-PS-20150304
Prep Type: Total/NA
Prep Batch: 178125

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	-3.38	U	0.0000	U	5.72	20.0	11.0	pCi/Samp	0.14	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Other Detected Radionuclide	None		None					pCi/Samp		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-2

Rad

Prep Batch: 178118

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10788-1	WAA-01-AF-PS-20150304	Total/NA	Filter	None	
160-10788-1 DU	WAA-01-AF-PS-20150304	Total/NA	Filter	None	
160-10788-2	WAA-02-AF-PS-20150304	Total/NA	Filter	None	
160-10788-3	WAA-03-AF-PS-20150304	Total/NA	Filter	None	
160-10788-4	WAA-04-AF-PS-20150304	Total/NA	Filter	None	
160-10788-5	WAA-05-AF-PS-20150304	Total/NA	Filter	None	
160-10788-6	WAA-00-AF-FB-20150304	Total/NA	Filter	None	
LCS 160-178118/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-178118/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-178118/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 178125

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10788-1	WAA-01-AF-PS-20150304	Total/NA	Filter	None	
160-10788-1 DU	WAA-01-AF-PS-20150304	Total/NA	Filter	None	
160-10788-2	WAA-02-AF-PS-20150304	Total/NA	Filter	None	
160-10788-3	WAA-03-AF-PS-20150304	Total/NA	Filter	None	
160-10788-4	WAA-04-AF-PS-20150304	Total/NA	Filter	None	
160-10788-5	WAA-05-AF-PS-20150304	Total/NA	Filter	None	
160-10788-6	WAA-00-AF-FB-20150304	Total/NA	Filter	None	
LCS 160-178125/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-178125/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 9, 2015

Sample Delivery Group (SDG): J10788

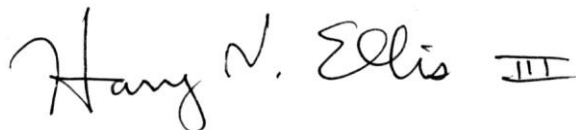
Sample Numbers: WAA-01-AF-PS-20150304, WAA-02-AF-PS-20150304, WAA-03-AF-PS-20150304, WAA-04-AF-PS-20150304, WAA-05-AF-PS-20150304, and WAA-00-AF-FB-20150304

Matrix / Number of Samples: 5 Air Samples and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



9 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10788 included five (5) environmental air (filter) samples and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and uranium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded low activities for two (of three) thorium isotopes and the field blank yielded low activities for one of them, while neither yielded detectable activities for any of the three uranium isotopes. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a “carrier” or “tracer”, whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory’s QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits (“RL”). These extrapolations should be qualified as estimated (flagged “J”).

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10788-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:

4/8/2015 1:49:38 PM

Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	14
QC Association Summary	17
Tracer Carrier Summary	18

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Job ID: 160-10788-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10788-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 03/09/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 18.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5) and WAA-00-AF-FB-20150304 (160-10788-6) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 03/13/2015 and analyzed on 03/22/2015.

Prep batch 178988: The following samples are filters that were split between multiple analyses: WAA-00-AF-FB-20150304 (160-10788-6), WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5). Insufficient sample volume was available to perform a sample duplicate (DUP). A LCS/LCSD was performed.

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Job ID: 160-10788-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5) and WAA-00-AF-FB-20150304 (160-10788-6) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/18/2015 and analyzed on 03/30/2015.

Prep batch 179746: The following samples are filters that were split between multiple analyses: WAA-00-AF-FB-20150304 (160-10788-6), WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5). Insufficient sample volume was available to perform a sample duplicate (DUP). A LCS/LCSD was performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5) and WAA-00-AF-FB-20150304 (160-10788-6) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/18/2015 and analyzed on 03/30/2015.

Prep batch 179747: The following samples are filters that were split between multiple analyses: WAA-00-AF-FB-20150304 (160-10788-6), WAA-01-AF-PS-20150304 (160-10788-1), WAA-02-AF-PS-20150304 (160-10788-2), WAA-03-AF-PS-20150304 (160-10788-3), WAA-04-AF-PS-20150304 (160-10788-4), WAA-05-AF-PS-20150304 (160-10788-5). Insufficient sample volume was available to perform a sample duplicate (DUP). A LCS/LCSD was performed.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10788-1

Login Number: 10788

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Method	Method Description	Protocol	Laboratory
9315	Total Alpha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.

TestAmerica Job ID: 160-10788-1

Project/Site: West Lake Landfill - Filters

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10788-1	WAA-01-AF-PS-20150304	Filter	03/04/15 11:15	03/09/15 10:25
160-10788-2	WAA-02-AF-PS-20150304	Filter	03/04/15 10:24	03/09/15 10:25
160-10788-3	WAA-03-AF-PS-20150304	Filter	03/04/15 11:04	03/09/15 10:25
160-10788-4	WAA-04-AF-PS-20150304	Filter	03/04/15 10:53	03/09/15 10:25
160-10788-5	WAA-05-AF-PS-20150304	Filter	03/04/15 10:36	03/09/15 10:25
160-10788-6	WAA-00-AF-FB-20150304	Filter	03/04/15 00:00	03/09/15 10:25

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Client Sample ID: WAA-01-AF-PS-20150304

Lab Sample ID: 160-10788-1

Date Collected: 03/04/15 11:15

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.402	U	0.393	0.394	1.00	0.630	pCi/Sample	03/13/15 09:41	03/22/15 19:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	98.2		40 - 110					03/13/15 09:41	03/22/15 19:15	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.350	J	0.191	0.193	1.00	0.227	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.201	J	0.121	0.122	1.00	0.0548	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.0182	U	0.0363	0.0364	1.00	0.0545	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	91.6		30 - 110					03/18/15 08:35	03/30/15 22:12	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.176	J	0.118	0.119	1.00	0.0588	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.0630	U	0.0869	0.0871	1.00	0.135	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.0587	J	0.0678	0.0680	1.00	0.0587	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	90.4		30 - 110					03/18/15 08:35	03/30/15 22:09	1

Client Sample ID: WAA-02-AF-PS-20150304

Lab Sample ID: 160-10788-2

Date Collected: 03/04/15 10:24

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.236	U	0.374	0.375	1.00	0.637	pCi/Sample	03/13/15 09:41	03/22/15 19:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.3		40 - 110					03/13/15 09:41	03/22/15 19:15	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.389	J	0.197	0.199	1.00	0.218	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.338	J	0.163	0.166	1.00	0.122	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.111	J	0.0905	0.0909	1.00	0.0554	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1

HVE 9 April 2015

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Client Sample ID: WAA-02-AF-PS-20150304

Lab Sample ID: 160-10788-2

Date Collected: 03/04/15 10:24

Matrix: Filter

Date Received: 03/09/15 10:25

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	91.1		30 - 110	03/18/15 08:35	03/30/15 22:12	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.132	U	0.123	0.123	1.00	0.168	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.0670	U	0.0924	0.0926	1.00	0.143	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.0485	U	0.0901	0.0902	1.00	0.168	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	81.3		30 - 110	03/18/15 08:35	03/30/15 22:09	1

Client Sample ID: WAA-03-AF-PS-20150304

Lab Sample ID: 160-10788-3

Date Collected: 03/04/15 11:04

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.338	U	0.356	0.357	1.00	0.575	pCi/Sample	03/13/15 09:41	03/22/15 19:15	1

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	97.1		40 - 110	03/13/15 09:41	03/22/15 19:15	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.588	J	0.229	0.234	1.00	0.219	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.363	J	0.167	0.169	1.00	0.119	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.100	J	0.0893	0.0897	1.00	0.0994	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	96.9		30 - 110	03/18/15 08:35	03/30/15 22:12	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.202	J	0.127	0.128	1.00	0.105	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.0237	U	0.0474	0.0474	1.00	0.0711	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.144	J	0.109	0.109	1.00	0.105	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	93.7		30 - 110	03/18/15 08:35	03/30/15 22:09	1

HUG 9 Apr 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Client Sample ID: WAA-04-AF-PS-20150304

Lab Sample ID: 160-10788-4

Date Collected: 03/04/15 10:53

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.0849	U	0.356	0.357	1.00	0.641	pCi/Sample	03/13/15 09:41	03/22/15 19:16	1
Carrier	% Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					03/13/15 09:41	03/22/15 19:16	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.293	U	0.190	0.192	1.00	0.250	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.176	U	0.123	0.124	1.00	0.126	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.0521	U	0.0753	0.0755	1.00	0.125	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Tracer	% Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	90.6		30 - 110					03/18/15 08:35	03/30/15 22:12	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	-0.0693	U	0.0909	0.0911	1.00	0.248	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	-0.100	U	0.101	0.101	1.00	0.301	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.143	U	0.108	0.109	1.00	0.104	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Tracer	% Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	92.1		30 - 110					03/18/15 08:35	03/30/15 22:09	1

Client Sample ID: WAA-05-AF-PS-20150304

Lab Sample ID: 160-10788-5

Date Collected: 03/04/15 10:36

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.521	U	0.390	0.393	1.00	0.593	pCi/Sample	03/13/15 09:41	03/22/15 20:06	1
Carrier	% Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	102		40 - 110					03/13/15 09:41	03/22/15 20:06	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.260	U	0.189	0.191	1.00	0.264	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.235	U	0.141	0.142	1.00	0.127	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	-0.0160	U	0.0226	0.0227	1.00	0.126	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Tracer	% Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	88.3		30 - 110					03/18/15 08:35	03/30/15 22:12	1

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TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Client Sample ID: WAA-05-AF-PS-20150304

Lab Sample ID: 160-10788-5

Date Collected: 03/04/15 10:36

Matrix: Filter

Date Received: 03/09/15 10:25

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0110	U	0.0408	0.0408	1.00	0.104	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.000	U	0.0195	0.0195	1.00	0.0704	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.0486	U	0.0670	0.0671	1.00	0.104	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	91.4		30 - 110					03/18/15 08:35	03/30/15 22:09	1

Client Sample ID: WAA-00-AF-FB-20150304

Lab Sample ID: 160-10788-6

Date Collected: 03/04/15 00:00

Matrix: Filter

Date Received: 03/09/15 10:25

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.171	U	0.311	0.312	1.00	0.540	pCi/Sample	03/13/15 09:41	03/22/15 20:06	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	99.7		40 - 110					03/13/15 09:41	03/22/15 20:06	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.377	U	0.203	0.205	1.00	0.233	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.120	U	0.115	0.115	1.00	0.160	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.0569	U	0.0671	0.0672	1.00	0.0592	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	86.5		30 - 110					03/18/15 08:35	03/30/15 22:12	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.0801	U	0.0956	0.0959	1.00	0.149	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.000	U	0.0192	0.0192	1.00	0.0690	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.0845	U	0.0839	0.0842	1.00	0.102	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	93.5		30 - 110					03/18/15 08:35	03/30/15 22:09	1

HUE 9 Apr 15

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Method: 9315 - Total Apha Radium (GFPC)

Lab Sample ID: MB 160-178988/1-A

Matrix: Filter

Analysis Batch: 180374

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 178988

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.2666	U	0.301	0.302	1.00	0.489	pCi/Sample	03/13/15 09:41	03/22/15 19:14	1
Carrier	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	86.4		40 - 110					03/13/15 09:41	03/22/15 19:14	1

Lab Sample ID: LCS 160-178988/2-A

Matrix: Filter

Analysis Batch: 180374

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 178988

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Total Alpha Radium	44.7	46.70		4.77	1.00	0.600	pCi/Samp	105	65 - 150		
Carrier	LCS %Yield	LCS Qualifier	Limits								
Ba Carrier	88.8		40 - 110								

Lab Sample ID: LCSD 160-178988/3-A

Matrix: Filter

Analysis Batch: 180374

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 178988

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Total Alpha Radium	44.7	45.95		4.69	1.00	0.604	pCi/Samp	103	65 - 150	0.08	1
Carrier	LCSD %Yield	LCSD Qualifier	Limits								
Ba Carrier	94.1		40 - 110								

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-179746/1-A

Matrix: Filter

Analysis Batch: 182277

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 179746

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.2639		0.173	0.175	1.00	0.222	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-230	0.5389		0.202	0.207	1.00	0.0566	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Thorium-232	0.01877	U	0.0375	0.0376	1.00	0.0563	pCi/Sample	03/18/15 08:35	03/30/15 22:12	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	90.8		30 - 110					03/18/15 08:35	03/30/15 22:12	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-179746/2-A

Matrix: Filter

Analysis Batch: 182278

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 179746

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	16.1	16.24		1.75	1.00	0.0561	pCi/Samp	101	81 - 118

Tracer	LCS %Yield	LCS Qualifier	Limits
Thorium-229	96.0		30 - 110

Lab Sample ID: LCSD 160-179746/3-A

Matrix: Filter

Analysis Batch: 182279

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 179746

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	16.1	16.23		1.75	1.00	0.150	pCi/Samp	101	81 - 118	0	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Thorium-229	93.2		30 - 110

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-179747/1-A

Matrix: Filter

Analysis Batch: 182266

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 179747

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.09825	U	0.106	0.106	1.00	0.153	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-235/236	0.04075	U	0.0759	0.0760	1.00	0.142	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Uranium-238	0.06537	U	0.0861	0.0863	1.00	0.136	pCi/Sample	03/18/15 08:35	03/30/15 22:09	1
Tracer	MB %Yield	MB Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	86.0		30 - 110					03/18/15 08:35	03/30/15 22:09	1

Lab Sample ID: LCS 160-179747/2-A

Matrix: Filter

Analysis Batch: 182267

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 179747

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Uranium-233/234	25.5	24.11		2.46	1.00	0.112	pCi/Samp	95	84 - 120
Uranium-238	26.0	24.16		2.46	1.00	0.133	pCi/Samp	93	82 - 122

Tracer	LCS %Yield	LCS Qualifier	Limits
Uranium-232	86.7		30 - 110

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-179747/3-A

Matrix: Filter

Analysis Batch: 182268

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 179747

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234	25.5	24.12		2.46	1.00	0.132	pCi/Samp	95	84 - 120	0	1
Uranium-238	26.0	25.76		2.60	1.00	0.132	pCi/Samp	99	82 - 122	0.32	1
Tracer	LCSD %Yield	LCSD Qualifier	Limits								
Uranium-232	85.5		30 - 110								

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Rad

Prep Batch: 178988

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10788-1	WAA-01-AF-PS-20150304	Total/NA	Filter	DPS-0	
160-10788-2	WAA-02-AF-PS-20150304	Total/NA	Filter	DPS-0	
160-10788-3	WAA-03-AF-PS-20150304	Total/NA	Filter	DPS-0	
160-10788-4	WAA-04-AF-PS-20150304	Total/NA	Filter	DPS-0	
160-10788-5	WAA-05-AF-PS-20150304	Total/NA	Filter	DPS-0	
160-10788-6	WAA-00-AF-FB-20150304	Total/NA	Filter	DPS-0	
LCS 160-178988/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-178988/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-178988/1-A	Method Blank	Total/NA	Filter	DPS-0	

Prep Batch: 179746

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10788-1	WAA-01-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-2	WAA-02-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-3	WAA-03-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-4	WAA-04-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-5	WAA-05-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-6	WAA-00-AF-FB-20150304	Total/NA	Filter	ExtChrom	
LCS 160-179746/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-179746/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-179746/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 179747

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10788-1	WAA-01-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-2	WAA-02-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-3	WAA-03-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-4	WAA-04-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-5	WAA-05-AF-PS-20150304	Total/NA	Filter	ExtChrom	
160-10788-6	WAA-00-AF-FB-20150304	Total/NA	Filter	ExtChrom	
LCS 160-179747/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-179747/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-179747/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10788-1

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Ba (40-110)					
160-10788-1	WAA-01-AF-PS-20150304	98.2					
160-10788-2	WAA-02-AF-PS-20150304	97.3					
160-10788-3	WAA-03-AF-PS-20150304	97.1					
160-10788-4	WAA-04-AF-PS-20150304	102					
160-10788-5	WAA-05-AF-PS-20150304	102					
160-10788-6	WAA-00-AF-FB-20150304	99.7					
LCS 160-178988/2-A	Lab Control Sample	88.8					
LCSD 160-178988/3-A	Lab Control Sample Dup	94.1					
MB 160-178988/1-A	Method Blank	86.4					
Tracer/Carrier Legend							
Ba = Ba Carrier							

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	Th-229 (30-110)					
160-10788-1	WAA-01-AF-PS-20150304	91.6					
160-10788-2	WAA-02-AF-PS-20150304	91.1					
160-10788-3	WAA-03-AF-PS-20150304	96.9					
160-10788-4	WAA-04-AF-PS-20150304	90.6					
160-10788-5	WAA-05-AF-PS-20150304	88.3					
160-10788-6	WAA-00-AF-FB-20150304	86.5					
LCS 160-179746/2-A	Lab Control Sample	96.0					
LCSD 160-179746/3-A	Lab Control Sample Dup	93.2					
MB 160-179746/1-A	Method Blank	90.8					
Tracer/Carrier Legend							
Th-229 = Thorium-229							

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)					
Lab Sample ID	Client Sample ID	U-232 (30-110)					
160-10788-1	WAA-01-AF-PS-20150304	90.4					
160-10788-2	WAA-02-AF-PS-20150304	81.3					
160-10788-3	WAA-03-AF-PS-20150304	93.7					
160-10788-4	WAA-04-AF-PS-20150304	92.1					
160-10788-5	WAA-05-AF-PS-20150304	91.4					
160-10788-6	WAA-00-AF-FB-20150304	93.5					
LCS 160-179747/2-A	Lab Control Sample	86.7					
LCSD 160-179747/3-A	Lab Control Sample Dup	85.5					
MB 160-179747/1-A	Method Blank	86.0					
Tracer/Carrier Legend							
U-232 = Uranium-232							

TestAmerica St. Louis

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J10908

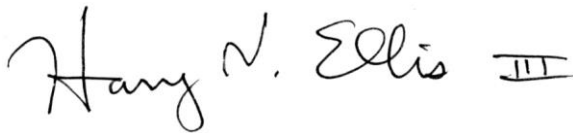
Sample Numbers: WAA-04-AF-PS-20150313 and WAA-00-AF-FB-20150313

Matrix / Number of Samples: 1 Air Sample and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10908 included one (1) environmental air (filter) sample and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank low alpha and beta activities. The field sample yielded more than 5 times the field blank beta activity, so no qualifications were applied for that. However, the field sample alpha activity was very similar to that of the field blank, so it was qualified as an artifact and flagged "U".

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10908-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher



Authorized for release by:
3/27/2015 4:57:48 PM

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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8

9

10

11

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	11
QC Association Summary	13



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Job ID: 160-10908-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10908-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 3/17/2015 2:05 PM; the samples arrived in good condition, properly preserved. The temperature of the cooler at receipt was 20.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared and analyzed on 03/18/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 03/18/2015.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Job ID: 160-10908-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

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13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Page 5 of 13

100-10300 C.A.M. V. Cuscuty



3/27/2015

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10908-1

Login Number: 10908

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10908-1	WAA-04-AF-PS-20150313	Filter	03/13/15 10:10	03/17/15 14:05
160-10908-2	WAA-00-AF-FB-20150313	Filter	03/13/15 00:00	03/17/15 14:05

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Client Sample ID: WAA-04-AF-PS-20150313

Lab Sample ID: 160-10908-1

Date Collected: 03/13/15 10:10

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.412	U	0.260	0.264	10.0	0.327	pCi/Sample	03/18/15 12:42	03/18/15 13:15	1
Gross Beta	17.6		1.17	2.11	10.0	0.421	pCi/Sample	03/18/15 12:42	03/18/15 13:15	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.120	U	3.96	3.96	20.0	7.55	pCi/Sample	03/18/15 12:55	03/18/15 20:51	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Be-7	107		49.8	50.9		69.2	pCi/Sample	03/18/15 12:55	03/18/15 20:51	1

Client Sample ID: WAA-00-AF-FB-20150313

Lab Sample ID: 160-10908-2

Date Collected: 03/13/15 00:00

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.321	U	0.234	0.237	10.0	0.309	pCi/Sample	03/18/15 12:43	03/18/15 13:15	1
Gross Beta	1.99		0.440	0.482	10.0	0.397	pCi/Sample	03/18/15 12:43	03/18/15 13:15	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	5.50	U	5.35	5.38	20.0	8.37	pCi/Sample	03/18/15 12:55	03/18/15 20:51	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/18/15 12:55	03/18/15 20:51	1

HUG
20 April 2015

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-179800/1-A
Matrix: Filter
Analysis Batch: 179770

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 179800

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.1293	U	0.186	0.186	10.0	0.316	pCi/Sample	03/18/15 12:42	03/18/15 13:15	1
Gross Beta	-0.01264	U	0.180	0.180	10.0	0.356	pCi/Sample	03/18/15 12:42	03/18/15 13:15	1

Lab Sample ID: LCS 160-179800/2-A
Matrix: Filter
Analysis Batch: 179770

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 179800

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.36	5.672		1.03	10.0	0.352	pCi/Samp	106	75 - 125

Lab Sample ID: LCSB 160-179800/3-A
Matrix: Filter
Analysis Batch: 179770

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 179800

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	17.99		2.15	10.0	0.370	pCi/Samp	101	75 - 125

Lab Sample ID: 160-10908-1 DU
Matrix: Filter
Analysis Batch: 179770

Client Sample ID: WAA-04-AF-PS-20150313
Prep Type: Total/NA
Prep Batch: 179800

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.412		0.5968		0.301	10.0	0.316	pCi/Samp	0.33	1
Gross Beta	17.6		18.46		2.19	10.0	0.356	pCi/Samp	0.20	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-179804/1-A
Matrix: Filter
Analysis Batch: 179636

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 179804

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	1.810	U	3.63	3.63	20.0	6.40	pCi/Sample	03/18/15 12:55	03/18/15 21:25	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	03/18/15 12:55	03/18/15 21:25	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-179804/2-A
Matrix: Filter
Analysis Batch: 179717

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 179804

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	31580		3280		118	pCi/Samp	99	87 - 116
Cesium-137	11100	10870		1140	20.0	58.9	pCi/Samp	98	87 - 120
Cobalt-60	11500	11290		1140		46.9	pCi/Samp	98	87 - 115

Lab Sample ID: 160-10908-1 DU
Matrix: Filter
Analysis Batch: 179720

Client Sample ID: WAA-04-AF-PS-20150313
Prep Type: Total/NA
Prep Batch: 179804

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	-0.120	U	0.0000	U	3.86	20.0	9.47	pCi/Samp	0.02	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Be-7	107		164.6		54.9		40.9	pCi/Samp	0.55	1

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-1

Rad

Prep Batch: 179800

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10908-1	WAA-04-AF-PS-20150313	Total/NA	Filter	None	
160-10908-1 DU	WAA-04-AF-PS-20150313	Total/NA	Filter	None	
160-10908-2	WAA-00-AF-FB-20150313	Total/NA	Filter	None	
LCS 160-179800/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-179800/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-179800/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 179804

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10908-1	WAA-04-AF-PS-20150313	Total/NA	Filter	None	
160-10908-1 DU	WAA-04-AF-PS-20150313	Total/NA	Filter	None	
160-10908-2	WAA-00-AF-FB-20150313	Total/NA	Filter	None	
LCS 160-179804/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-179804/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J10908

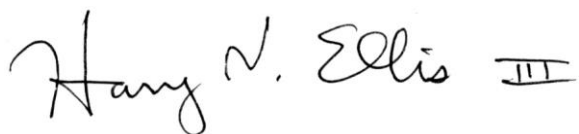
Sample Numbers: WAA-04-AF-PS-20150313 and WAA-00-AF-FB-20150313

Matrix / Number of Samples: 1 Air Sample and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J10908 included one (1) environmental air (filter) sample and one (1) QC sample (a field blank). Samples were analyzed for total alpha-emitting radium by EPA SW-846 Method 9315 and for isotopic (alpha-emitting) thorium and uranium by Department of Energy (DOE) Method A-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Insufficient sample was available for MS/MSD analyses. Duplicate LCS analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) and field blanks yielded low activities for one (of three) thorium isotopes and for none (of three) uranium isotopes. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries and relative percent differences from the duplicate LCS analyses were within established control limits.

V. Surrogates

These radioanalytical methods use a “carrier” or “tracer”, whose recovery serves the same functions as surrogate recoveries. All carrier and tracer recoveries were within the laboratory’s QC limits. No qualifications were applied.

VI. Comments

All detected results were less than their reporting limits (“RL”). These extrapolations should be qualified as estimated (flagged “J”). In the total alpha radium analysis, low sample volumes and high background counts led to some samples (including some laboratory QC samples) yielding minimum detectable concentrations above the reporting limit. No qualifications were applied for this, but data users should note that these results are not fully comparable with those from other sampling events.

VII. Overall Assessment of Data

Overall data quality is acceptable, with few qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-10908-2

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:

4/15/2015 11:01:28 AM

Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	6
Definitions/Glossary	7
Method Summary	8
Sample Summary	9
Client Sample Results	10
QC Sample Results	12
QC Association Summary	15
Tracer Carrier Summary	16



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Job ID: 160-10908-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-10908-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 03/17/2015; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 20.0° C.

TOTAL ALPHA RADIUM (GFPC)

Samples WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2) were analyzed for Total Alpha Radium (GFPC) in accordance with SW- 846 Method 9315. The samples were prepared on 03/26/2015 and analyzed on 03/30/2015.

Prep Batch 181597

The following samples are filters that were split between multiple analyses: WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2). Insufficient sample volume was available to perform a sample duplicate (DUP). A LCS/LCSD was performed.

The total alpha emitting radium detection goal was not met for the following sample due to insufficient sample available for analysis. The sample is a filter split among multiple analyses: WAA-00-AF-FB-20150313 (160-10908-2). Analytical results are reported with the

Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Job ID: 160-10908-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

detection limit achieved.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/26/2015 and analyzed on 04/01/2015.

Prep batch 181584

Insufficient sample volume was available to perform a sample duplicate (DUP) associated with batch 181584. The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate. WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Samples WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with A-01-R. The samples were prepared on 03/26/2015 and analyzed on 04/01/2015.

Prep batch 181586

Insufficient sample volume was available to perform a sample duplicate (DUP) associated with batch 181586. The samples are filters that must be split between multiple analysis. A LCS/LCSD was used instead of a sample duplicate. WAA-04-AF-PS-20150313 (160-10908-1) and WAA-00-AF-FB-20150313 (160-10908-2).

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Page 5 of 16

Lawrence J. O'Connell



4/15/2015

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-10908-2

Login Number: 10908

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.
G	The Sample MDC is greater than the requested RL.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Method	Method Description	Protocol	Laboratory
9315	Total Alpha Radium (GFPC)	SW846	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-10908-1	WAA-04-AF-PS-20150313	Filter	03/13/15 10:10	03/17/15 14:05
160-10908-2	WAA-00-AF-FB-20150313	Filter	03/13/15 00:00	03/17/15 14:05

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Client Sample ID: WAA-04-AF-PS-20150313

Lab Sample ID: 160-10908-1

Date Collected: 03/13/15 10:10

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.402	U	0.525	0.526	1.00	0.876	pCi/Sample	03/26/15 15:20	03/30/15 14:23	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.9		40 - 110					03/26/15 15:20	03/30/15 14:23	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.118	U	0.159	0.159	1.00	0.267	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-230	0.234	U	0.146	0.148	1.00	0.147	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-232	0.0818	U	0.0917	0.0919	1.00	0.132	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	88.8		30 - 110					03/26/15 14:39	04/01/15 10:32	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.00469	U	0.0885	0.0885	1.00	0.199	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-235/236	0.00389	U	0.0542	0.0542	1.00	0.154	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-238	0.0219	U	0.0574	0.0574	1.00	0.123	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.9		30 - 110					03/26/15 14:39	04/01/15 10:25	1

Client Sample ID: WAA-00-AF-FB-20150313

Lab Sample ID: 160-10908-2

Date Collected: 03/13/15 00:00

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.175	UG	0.724	0.724	1.00	1.30	pCi/Sample	03/26/15 15:20	03/30/15 14:24	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.9		40 - 110					03/26/15 15:20	03/30/15 14:24	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.118	U	0.128	0.128	1.00	0.199	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-230	0.572	U	0.215	0.221	1.00	0.152	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-232	0.0556	U	0.0734	0.0735	1.00	0.113	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1

HUG 2P Apr 28 15

TestAmerica St. Louis

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Client Sample ID: WAA-00-AF-FB-20150313

Lab Sample ID: 160-10908-2

Date Collected: 03/13/15 00:00

Matrix: Filter

Date Received: 03/17/15 14:05

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Thorium-229	86.1		30 - 110	03/26/15 14:39	04/01/15 10:32	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	BL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.117	U	0.109	0.109	1.00	0.149	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-235/236	0.0134	U	0.0498	0.0498	1.00	0.127	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-238	0.0584	U	0.0769	0.0770	1.00	0.121	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1

Tracer	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	92.0		30 - 110	03/26/15 14:39	04/01/15 10:25	1

HVE
20 Apr 15

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Client Sample ID: WAA-04-AF-PS-20150313

Lab Sample ID: 160-10908-1

Date Collected: 03/13/15 10:10

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.402	U	0.525	0.526	1.00	0.876	pCi/Sample	03/26/15 15:20	03/30/15 14:23	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.9		40 - 110					03/26/15 15:20	03/30/15 14:23	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.118	U	0.159	0.159	1.00	0.267	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-230	0.234		0.146	0.148	1.00	0.147	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-232	0.0818	U	0.0917	0.0919	1.00	0.132	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	88.8		30 - 110					03/26/15 14:39	04/01/15 10:32	1

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.00469	U	0.0885	0.0885	1.00	0.199	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-235/236	0.00389	U	0.0542	0.0542	1.00	0.154	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-238	0.0219	U	0.0574	0.0574	1.00	0.123	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Uranium-232	89.9		30 - 110					03/26/15 14:39	04/01/15 10:25	1

Client Sample ID: WAA-00-AF-FB-20150313

Lab Sample ID: 160-10908-2

Date Collected: 03/13/15 00:00

Matrix: Filter

Date Received: 03/17/15 14:05

Method: 9315 - Total Alpha Radium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Total Alpha Radium	0.175	U G	0.724	0.724	1.00	1.30	pCi/Sample	03/26/15 15:20	03/30/15 14:24	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Ba Carrier	97.9		40 - 110					03/26/15 15:20	03/30/15 14:24	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.118	U	0.128	0.128	1.00	0.199	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-230	0.572		0.215	0.221	1.00	0.152	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1
Thorium-232	0.0556	U	0.0734	0.0735	1.00	0.113	pCi/Sample	03/26/15 14:39	04/01/15 10:32	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-181584/2-A

Matrix: Filter

Analysis Batch: 182948

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 181584

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Thorium-230	16.1	17.58		1.87	1.00	0.124	pCi/Samp	109	81 - 118
Tracer	%Yield	LCS Qualifier	Limits						
Thorium-229	92.2		30 - 110						

Lab Sample ID: LCSD 160-181584/3-A

Matrix: Filter

Analysis Batch: 182949

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 181584

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Thorium-230	16.1	16.51		1.75	1.00	0.115	pCi/Samp	103	81 - 118	0.30	1
Tracer	%Yield	LCSD Qualifier	Limits								
Thorium-229	94.5		30 - 110								

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-181586/1-A

Matrix: Filter

Analysis Batch: 182913

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 181586

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.01876	U	0.0375	0.0376	1.00	0.0563	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-235/236	0.0000	U	0.0195	0.0195	1.00	0.0700	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Uranium-238	0.05618	U	0.0649	0.0650	1.00	0.0562	pCi/Sample	03/26/15 14:39	04/01/15 10:25	1
Tracer	%Yield	MB Qualifier	Limits							
Uranium-232	92.3		30 - 110							
								Prepared	Analyzed	Dil Fac
								03/26/15 14:39	04/01/15 10:25	1

Lab Sample ID: LCS 160-181586/2-A

Matrix: Filter

Analysis Batch: 182914

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 181586

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Uranium-233/234	25.5	25.59		2.59	1.00	0.0618	pCi/Samp	100	84 - 120
Uranium-238	26.0	27.21		2.73	1.00	0.114	pCi/Samp	104	82 - 122
Tracer	%Yield	LCS Qualifier	Limits						
Uranium-232	83.3		30 - 110						

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCSD 160-181586/3-A

Matrix: Filter

Analysis Batch: 182915

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 181586

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Uranium-233/234	25.5	23.59		2.41	1.00	0.0599	pCi/Samp	93	84 - 120	0.40	1
Uranium-238	26.0	24.68		2.50	1.00	0.0597	pCi/Samp	95	82 - 122	0.48	1

Tracer	LCSD %Yield	LCSD Qualifier	Limits
Uranium-232	87.7		30 - 110

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Rad

Prep Batch: 181584

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10908-1	WAA-04-AF-PS-20150313	Total/NA	Filter	ExtChrom	
160-10908-2	WAA-00-AF-FB-20150313	Total/NA	Filter	ExtChrom	
LCS 160-181584/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-181584/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-181584/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 181586

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10908-1	WAA-04-AF-PS-20150313	Total/NA	Filter	ExtChrom	
160-10908-2	WAA-00-AF-FB-20150313	Total/NA	Filter	ExtChrom	
LCS 160-181586/2-A	Lab Control Sample	Total/NA	Filter	ExtChrom	
LCSD 160-181586/3-A	Lab Control Sample Dup	Total/NA	Filter	ExtChrom	
MB 160-181586/1-A	Method Blank	Total/NA	Filter	ExtChrom	

Prep Batch: 181597

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-10908-1	WAA-04-AF-PS-20150313	Total/NA	Filter	DPS-0	
160-10908-2	WAA-00-AF-FB-20150313	Total/NA	Filter	DPS-0	
LCS 160-181597/2-A	Lab Control Sample	Total/NA	Filter	DPS-0	
LCSD 160-181597/3-A	Lab Control Sample Dup	Total/NA	Filter	DPS-0	
MB 160-181597/1-A	Method Blank	Total/NA	Filter	DPS-0	

Tracer/Carrier Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-10908-2

Method: 9315 - Total Apha Radium (GFPC)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	
160-10908-1	WAA-04-AF-PS-20150313	97.9	
160-10908-2	WAA-00-AF-FB-20150313	97.9	
LCS 160-181597/2-A	Lab Control Sample	91.2	
LCSD 160-181597/3-A	Lab Control Sample Dup	93.8	
MB 160-181597/1-A	Method Blank	97.6	
Tracer/Carrier Legend			
Ba = Ba Carrier			

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Th-229 (30-110)	
160-10908-1	WAA-04-AF-PS-20150313	88.8	
160-10908-2	WAA-00-AF-FB-20150313	86.1	
LCS 160-181584/2-A	Lab Control Sample	92.2	
LCSD 160-181584/3-A	Lab Control Sample Dup	94.5	
MB 160-181584/1-A	Method Blank	85.4	
Tracer/Carrier Legend			
Th-229 = Thorium-229			

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Filter

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	U-232 (30-110)	
160-10908-1	WAA-04-AF-PS-20150313	89.9	
160-10908-2	WAA-00-AF-FB-20150313	92.0	
LCS 160-181586/2-A	Lab Control Sample	83.3	
LCSD 160-181586/3-A	Lab Control Sample Dup	87.7	
MB 160-181586/1-A	Method Blank	92.3	
Tracer/Carrier Legend			
U-232 = Uranium-232			

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J11120

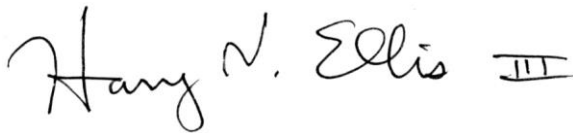
Sample Numbers: WAA-04-AF-PS-20150327 and WAA-00-AF-FB-20150327

Matrix / Number of Samples: 1 Air Sample and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J11120 included one (1) environmental air (filter) sample and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The field sample yielded more than 5 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-11120-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:

4/8/2015 3:10:33 PM

Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	4
Receipt Checklists	5
Definitions/Glossary	6
Method Summary	7
Sample Summary	8
Client Sample Results	9
QC Sample Results	10
QC Association Summary	12



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Job ID: 160-11120-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-11120-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 03/31/2015; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 18.3° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-04-AF-PS-20150327 (160-11120-1) and WAA-00-AF-FB-20150327 (160-11120-2) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared on 04/01/2015 and analyzed on 04/02/2015.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-04-AF-PS-20150327 (160-11120-1) and WAA-00-AF-FB-20150327 (160-11120-2) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared and analyzed on 04/01/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

[illegible]

Page 4 of 12

160-11120 Chain of Custody

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-11120-1

Login Number: 11120

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-11120-1	WAA-04-AF-PS-20150327	Filter	03/27/15 09:41	03/31/15 13:10
160-11120-2	WAA-00-AF-FB-20150327	Filter	03/27/15 00:00	03/31/15 13:10

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Client Sample ID: WAA-04-AF-PS-20150327

Lab Sample ID: 160-11120-1

Date Collected: 03/27/15 09:41

Matrix: Filter

Date Received: 03/31/15 13:10

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.450	U	0.285	0.289	10.0	0.370	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1
Gross Beta	11.3		0.940	1.47	10.0	0.366	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	1.44	U	5.06	5.06	20.0	9.21	pCi/Sample	04/01/15 11:04	04/01/15 18:44	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/01/15 11:04	04/01/15 18:44	1

Client Sample ID: WAA-00-AF-FB-20150327

Lab Sample ID: 160-11120-2

Date Collected: 03/27/15 00:00

Matrix: Filter

Date Received: 03/31/15 13:10

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.0465	U	0.170	0.170	10.0	0.337	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1
Gross Beta	1.40	J	0.378	0.403	10.0	0.371	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-2.52	U	6.81	6.81	20.0	11.8	pCi/Sample	04/01/15 11:04	04/01/15 18:45	1

Other Detected Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/01/15 11:04	04/01/15 18:45	1

HVE
20 April 2015

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-182696/1-A
Matrix: Filter
Analysis Batch: 182997

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 182696

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.04917	U	0.204	0.204	10.0	0.396	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1
Gross Beta	0.1170	U	0.206	0.206	10.0	0.358	pCi/Sample	04/01/15 11:02	04/02/15 06:53	1

Lab Sample ID: LCS 160-182696/2-A
Matrix: Filter
Analysis Batch: 182997

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 182696

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.36	5.226		0.985	10.0	0.372	pCi/Samp	97	75 - 125

Lab Sample ID: LCSB 160-182696/3-A
Matrix: Filter
Analysis Batch: 182997

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 182696

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	17.78		2.13	10.0	0.388	pCi/Samp	100	75 - 125

Lab Sample ID: 160-11120-1 DU
Matrix: Filter
Analysis Batch: 183055

Client Sample ID: WAA-04-AF-PS-20150327
Prep Type: Total/NA
Prep Batch: 182696

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.450		0.7639		0.369	10.0	0.414	pCi/Samp	0.48	1
Gross Beta	11.3		11.82		1.53	10.0	0.406	pCi/Samp	0.19	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-182697/1-A
Matrix: Filter
Analysis Batch: 182671

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 182697

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.4414	U	4.35	4.35	20.0	8.09	pCi/Sample	04/01/15 11:04	04/01/15 18:44	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/01/15 11:04	04/01/15 18:44	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-182697/2-A
Matrix: Filter
Analysis Batch: 182674

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 182697

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	30710		3200		131	pCi/Samç	96	87 - 116
Cesium-137	11100	10940		1150	20.0	69.8	pCi/Samç	99	87 - 120
Cobalt-60	11500	11400		1150		50.0	pCi/Samç	99	87 - 115

Lab Sample ID: 160-11120-1 DU
Matrix: Filter
Analysis Batch: 182670

Client Sample ID: WAA-04-AF-PS-20150327
Prep Type: Total/NA
Prep Batch: 182697

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	1.44	U	-2.130	U	5.73	20.0	10.0	pCi/Samç	0.33	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Other Detected Radionuclide	None		None					pCi/Samç		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11120-1

Rad

Prep Batch: 182696

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-11120-1	WAA-04-AF-PS-20150327	Total/NA	Filter	None	
160-11120-1 DU	WAA-04-AF-PS-20150327	Total/NA	Filter	None	
160-11120-2	WAA-00-AF-FB-20150327	Total/NA	Filter	None	
LCS 160-182696/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-182696/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-182696/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 182697

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-11120-1	WAA-04-AF-PS-20150327	Total/NA	Filter	None	
160-11120-1 DU	WAA-04-AF-PS-20150327	Total/NA	Filter	None	
160-11120-2	WAA-00-AF-FB-20150327	Total/NA	Filter	None	
LCS 160-182697/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-182697/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: TestAmerica Laboratories, Inc. (Earth City, Missouri)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): J11233

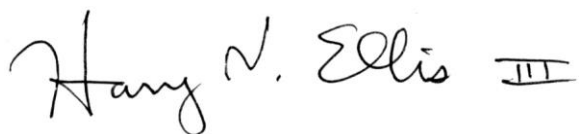
Sample Numbers: WAA-04-AF-PS-20150403 and WAA-00-AF-FB-20150403

Matrix / Number of Samples: 1 Air Sample and 1 Field Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) and the EPA and others document "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (July 2004) were used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) J11233 included one (1) environmental air (filter) sample and one (1) QC samples (a field blank). Samples were analyzed for gross alpha and beta radiation by EPA SW-846 Method 9310 and for cesium-137 and other gamma-emitters by Department of Energy (DOE) Method Ga-01-R. The following summarizes the data validation that was performed.

RADIOANALYTICAL ANALYSES

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 6 months from sample collection to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. LCS and duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

The laboratory (method) blank yielded no detectable activities and the field blank a low beta activity. The field sample yielded about 5 times the field blank beta activity, so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All percent recoveries from the LCS analyses were within established control limits. No qualifications were applied.

V. Surrogates

Surrogates are not used in these radioanalytical methods.

VI. Comments

Some detected activities were less than their reporting limits ("RL"). These extrapolations should be qualified as estimated (flagged "J").

VII. Overall Assessment of Data

Overall data quality is acceptable, with no significant qualifications applied. All data are usable as qualified for their intended purposes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-11233-1

Client Project/Site: West Lake Landfill - Filters

For:

Tetra Tech EM Inc.
415 Oak Street
Kansas City, Missouri 64106

Attn: Ms. Emily Fisher

Elizabeth M. Hoerchler

Authorized for release by:

4/14/2015 3:56:03 PM

Elizabeth Hoerchler, Project Mgmt. Assistant
elizabeth.hoerchler@testamericainc.com

Designee for

Erika Gish, Project Manager II
(314)298-8566
erika.gish@testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	4
Receipt Checklists	5
Definitions/Glossary	6
Method Summary	7
Sample Summary	8
Client Sample Results	9
QC Sample Results	10
QC Association Summary	12



Case Narrative

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Job ID: 160-11233-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Tetra Tech EM Inc.

Project: West Lake Landfill - Filters

Report Number: 160-11233-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 04/07/2015; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 18.0° C.

GROSS ALPHA AND GROSS BETA RADIOACTIVITY

Samples WAA-04-AF-PS-20150403 (160-11233-1) and WAA-00-AF-FB-20150403 (160-11233-2) were analyzed for Gross Alpha and Gross Beta Radioactivity in accordance with SW846 9310. The samples were prepared on 04/10/2015 and analyzed on 04/12/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 & OTHER GAMMA EMITTERS (GS)

Samples WAA-04-AF-PS-20150403 (160-11233-1) and WAA-00-AF-FB-20150403 (160-11233-2) were analyzed for Radium-226 & Other Gamma Emitters (GS) in accordance with GA-01-R. The samples were prepared on 04/10/2015 and analyzed on 04/11/2015.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

13715 Rider Trail North

Chain of Custody Record

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Earth City, MO 63045
phone 314.298.8566 fax

Regulatory Program: ☐ DW ☐ INPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc.

Client Contact		Project Manager: Dave Kinroth		Site Contact: Dave Kinroth		Date: 4-7-15		COC No:							
Tetra Tech, Inc.		Tel/Fax: 314-517-6798		Lab Contact: Mike Franks		Carrier: NA		1 of 1 COCs							
415 Oak Street		Analysis Turnaround Time						Sampler:							
Kansas City, MO 64106		<input type="checkbox"/> CALENDAR DAYS <input checked="" type="checkbox"/> WORKING DAYS						For Lab Use Only:							
(816) 412-1786 Phone		TAT if different from Below 20						Walk-in Client:							
(816) 816-410-1748 FAX		<input type="checkbox"/> 2 weeks						Lab Sampling:							
Project Name: West Lake Landfill Site		<input type="checkbox"/> 1 week													
Site: Bridgeton, MO		<input type="checkbox"/> 2 days						Job / SDG No.:							
P O # 1105610		<input type="checkbox"/> 1 day													
Sample Identification		Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	9310 Gross Alpha/Beta	GA-01-R Gamm Spec	9315 Total Alpha Radium	A-01-R Isotopic Thorium	A-01-R Isotopic Uranium	* 9315 Radium-226 (GFPC)	Sample Specific Notes:
0	4/3/15	0:00	Filter	Air	1				X	X	X	X	X	X	* 9315 Radium-226 (GFPC)
0	1/0/00	0:00	Filter	Air	1				X	X	X	X	X	X	contingent upon TAR results
0	1/0/00	0:00	Filter	Air	1				X	X	X	X	X	X	for all samples
WAA-04-AF-PS-20150403	4/3/15	9:20	Filter	Air	1				X	X	X	X	X	X	
0	1/0/00	0:00	Filter	Air	1				X	X	X	X	X	X	
WAA-00-AF-FB-20150403	4/3/15	NA	Filter	Air	1				X	X	X	X	X	X	
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other															
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.							Sample Disposal (A fee may be assessed if samples are retained longer than								
<input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown							<input type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive for _____ Months								
Special Instructions/QC Requirements & Comments:															
Custody Seals Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No		Custody Seal No.:				Cooler Temp. (°C): Obs'd: _____ Corr'd: _____				Therm ID No.:					
Relinquished by: <i>Tony Balaban</i>		Company: <i>Tetra Tech</i>		Date/Time: <i>4/7/15 1320</i>		Received by: <i>Jim Clark</i>		Company: <i>TA 57L</i>		Date/Time: <i>4-7-15 1320</i>					
Relinquished by:		Company:		Date/Time:		Received by:		Company:		Date/Time:					
Relinquished by:		Company:		Date/Time:		Received in Laboratory by:		Company:		Date/Time:					

Login Sample Receipt Checklist

Client: Tetra Tech EM Inc.

Job Number: 160-11233-1

Login Number: 11233

List Source: TestAmerica St. Louis

List Number: 1

Creator: Clarke, Jill C

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Qualifiers

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Method	Method Description	Protocol	Laboratory
9310	Gross Alpha / Beta (GFPC)	SW846	TAL SL
GA-01-R	Cesium-137 & Other Gamma Emitters (GS)	DOE	TAL SL

Protocol References:

DOE = U.S. Department of Energy

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-11233-1	WAA-04-AF-PS-20150403	Filter	04/03/15 09:20	04/07/15 13:20
160-11233-2	WAA-00-AF-FB-20150403	Filter	04/03/15 00:00	04/07/15 13:20

Client Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Client Sample ID: WAA-04-AF-PS-20150403

Lab Sample ID: 160-11233-1

Date Collected: 04/03/15 09:20

Matrix: Filter

Date Received: 04/07/15 13:20

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.520	J	0.294	0.300	10.0	0.356	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1
Gross Beta	10.6		0.916	1.40	10.0	0.370	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	1.85	U	4.84	4.84	20.0	8.68	pCi/Sample	04/10/15 10:34	04/11/15 09:03	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/10/15 10:34	04/11/15 09:03	1

Client Sample ID: WAA-00-AF-FB-20150403

Lab Sample ID: 160-11233-2

Date Collected: 04/03/15 00:00

Matrix: Filter

Date Received: 04/07/15 13:20

Method: 9310 - Gross Alpha / Beta (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.0190	U	0.191	0.191	10.0	0.388	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1
Gross Beta	2.16	J	0.468	0.516	10.0	0.438	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	0.650	U	6.06	6.06	20.0	11.4	pCi/Sample	04/10/15 10:34	04/11/15 09:05	1
Other Detected										
Radionuclides	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/10/15 10:34	04/11/15 09:05	1

HUE
20 April 2017

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Method: 9310 - Gross Alpha / Beta (GFPC)

Lab Sample ID: MB 160-184913/1-A

Matrix: Filter

Analysis Batch: 185078

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 184913

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Gross Alpha	0.07115	U	0.184	0.184	10.0	0.349	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1
Gross Beta	0.1760	U	0.220	0.220	10.0	0.364	pCi/Sample	04/10/15 10:25	04/12/15 20:32	1

Lab Sample ID: LCS 160-184913/2-A

Matrix: Filter

Analysis Batch: 185078

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 184913

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Alpha	5.36	5.751		1.07	10.0	0.409	pCi/Samp	107	75 - 125

Lab Sample ID: LCSB 160-184913/3-A

Matrix: Filter

Analysis Batch: 185078

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 184913

Analyte	Spike Added	LCSB Result	LCSB Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Gross Beta	17.8	18.66		2.22	10.0	0.405	pCi/Samp	105	75 - 125

Lab Sample ID: 160-11233-1 DU

Matrix: Filter

Analysis Batch: 185078

Client Sample ID: WAA-04-AF-PS-20150403

Prep Type: Total/NA

Prep Batch: 184913

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Gross Alpha	0.520		0.2988	U	0.247	10.0	0.349	pCi/Samp	0.40	1
Gross Beta	10.6		10.77		1.42	10.0	0.364	pCi/Samp	0.07	1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-184916/1-A

Matrix: Filter

Analysis Batch: 185038

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 184916

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-1.242	U	5.34	5.35	20.0	9.56	pCi/Sample	04/10/15 10:34	04/11/15 09:03	1
Other Detected Radionuclides	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Other Detected Radionuclide	None						pCi/Sample	04/10/15 10:34	04/11/15 09:03	1

TestAmerica St. Louis

QC Sample Results

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-184916/2-A
Matrix: Filter
Analysis Batch: 185037

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 184916

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	32000	31450		3270		115	pCi/Samp	98	87 - 116
Cesium-137	11100	10910		1150	20.0	63.8	pCi/Samp	99	87 - 120
Cobalt-60	11400	11160		1130		52.6	pCi/Samp	98	87 - 115

Lab Sample ID: 160-11233-1 DU
Matrix: Filter
Analysis Batch: 185037

Client Sample ID: WAA-04-AF-PS-20150403
Prep Type: Total/NA
Prep Batch: 184916

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Cesium-137	1.85	U	0.2520	U	5.84	20.0	10.7	pCi/Samp	0.15	1
Other Detected Radionuclides	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Other Detected Radionuclide	None		None					pCi/Samp		

QC Association Summary

Client: Tetra Tech EM Inc.
Project/Site: West Lake Landfill - Filters

TestAmerica Job ID: 160-11233-1

Rad

Prep Batch: 184913

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-11233-1	WAA-04-AF-PS-20150403	Total/NA	Filter	None	
160-11233-1 DU	WAA-04-AF-PS-20150403	Total/NA	Filter	None	
160-11233-2	WAA-00-AF-FB-20150403	Total/NA	Filter	None	
LCS 160-184913/2-A	Lab Control Sample	Total/NA	Filter	None	
LCSB 160-184913/3-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-184913/1-A	Method Blank	Total/NA	Filter	None	

Prep Batch: 184916

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-11233-1	WAA-04-AF-PS-20150403	Total/NA	Filter	None	
160-11233-1 DU	WAA-04-AF-PS-20150403	Total/NA	Filter	None	
160-11233-2	WAA-00-AF-FB-20150403	Total/NA	Filter	None	
LCS 160-184916/2-A	Lab Control Sample	Total/NA	Filter	None	
MB 160-184916/1-A	Method Blank	Total/NA	Filter	None	

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: Pace Analytical Services, Inc. (Lenexa, Kansas)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 16, 2015

Sample Delivery Group (SDG): 60188508

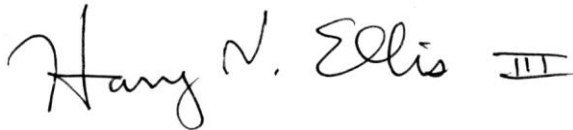
Sample Numbers: WAA-01-RV-PS-20150220, WAA-02-RV-PS-20150220,
WAA-03-RV-PS-20150220, WAA-04-RV-PS-20150220,
WAA-04-RV-DU-20150220, WAA-05-RV-PS-20150220, and
WAA-00-RV-TB-20150220

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



16 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60188508 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank. The field blank yielded concentrations of four aromatic hydrocarbons, suggesting contamination from kerosene or a similar mixture that occurred during sample processing or analysis. The similar concentrations of these analytes in the four field samples analyzed with the field blank were qualified as artifacts and flagged "U".

IV. Laboratory Control Sample (LCS)

All results from one LCS pair were within QC limits. However, most analytes in the duplicate LCS analyzed with samples WAA-03-RV-PS-20150220 and WAA-04-RV-DU-20150220 yielded recoveries below the laboratory's QC limits. The laboratory ascribed these irregularities to a lack of sensitivity associated with low responses to the continuing calibration standard. Due to the pervasiveness of these irregularities, all results for samples WAA-03-RV-PS-20150220 and WAA-04-RV-DU-20150220 were qualified as estimated, possibly biased low, and flagged "J" or "UJ", as appropriate.

V. Surrogates

All surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

After application of the qualifications discussed above, trichloroethene was reported in one sample and toluene in two others. There are significant differences in the field duplicate pair, apparently a consequence of the fact that they were analyzed in separate batches. Each resembles the samples it was analyzed with more than it resembles the other member of the pair.

VII. Overall Assessment of Data

The results from these analyses, even after application of qualifications, are very different from those of preceding sampling events. Unless these sorts of results are confirmed by subsequent sampling events, they should be rejected.

March 19, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60188508

Dear Emily Fisher:

Enclosed are the analytical results for sample(s) received by the laboratory on February 24, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alaska Certification #: UST-078

Alaska Certification #MN00064

Alabama Certification #40770

Arizona Certification #: AZ-0014

Arkansas Certification #: 88-0680

California Certification #: 01155CA

Colorado Certification #Pace

Connecticut Certification #: PH-0256

EPA Region 8 Certification #: 8TMS-L

Florida/NELAP Certification #: E87605

Guam Certification #: 14-008r

Georgia Certification #: 959

Georgia EPD #: Pace

Idaho Certification #: MN00064

Hawaii Certification #MN00064

Illinois Certification #: 200011

Indiana Certification#C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky Dept of Envi. Protection - DW #90062

Kentucky Dept of Envi. Protection - WW #:90062

Louisiana DEQ Certification #: 3086

Louisiana DHH #: LA140001

Maine Certification #: 2013011

Maryland Certification #: 322

Michigan DEPH Certification #: 9909

Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace

Montana Certification #: MT0092

Nevada Certification #: MN_00064

Nebraska Certification #: Pace

New Jersey Certification #: MN-002

New York Certification #: 11647

North Carolina Certification #: 530

North Carolina State Public Health #: 27700

North Dakota Certification #: R-036

Ohio EPA #: 4150

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507

Oregon Certification #: MN200001

Oregon Certification #: MN300001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification

Saipan (CNMI) #:MP0003

South Carolina #:74003001

Texas Certification #: T104704192

Tennessee Certification #: 02818

Utah Certification #: MN000642013-4

Virginia DGS Certification #: 251

Virginia/VELAP Certification #: Pace

Washington Certification #: C486

West Virginia Certification #: 382

West Virginia DHHR #:9952C

Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60188508001	WAA-01-RV-PS-20150220	Air	02/20/15 13:00	02/24/15 09:40
60188508002	WAA-02-RV-PS-20150220	Air	02/20/15 12:07	02/24/15 09:40
60188508003	WAA-03-RV-PS-20150220	Air	02/20/15 12:32	02/24/15 09:40
60188508004	WAA-04-RV-PS-20150220	Air	02/20/15 12:50	02/24/15 09:40
60188508005	WAA-05-RV-PS-20150220	Air	02/20/15 12:20	02/24/15 09:40
60188508006	WAA-04-RV-DU-20150220	Air	02/20/15 12:50	02/24/15 09:40
60188508007	WAA-00-RV-TB-20150220	Air	02/20/15 13:10	02/24/15 09:40

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60188508001	WAA-01-RV-PS-20150220	TO-17M	RTP	13	PASI-M
60188508002	WAA-02-RV-PS-20150220	TO-17M	RTP	13	PASI-M
60188508003	WAA-03-RV-PS-20150220	TO-17M	RTP	15	PASI-M
60188508004	WAA-04-RV-PS-20150220	TO-17M	RTP	13	PASI-M
60188508005	WAA-05-RV-PS-20150220	TO-17M	RTP	13	PASI-M
60188508006	WAA-04-RV-DU-20150220	TO-17M	RTP	15	PASI-M
60188508007	WAA-00-RV-TB-20150220	TO-17M	RTP	13	PASI-M

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-01-RV-PS-20150220		Lab ID: 60188508001		Collected: 02/20/15 13:00		Received: 02/24/15 09:40		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	156-60-5		
Ethylbenzene	0.21	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 15:44	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	1634-04-4		
Tetrachloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 15:44	127-18-4		
Trichloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 15:44	79-01-6		
1,2,4-Trimethylbenzene	0.32	ug/m3	0.24	1	02/27/15 08:34	02/27/15 15:44	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 15:44	108-67-8		
Vinyl chloride	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	75-01-4		
m&p-Xylene	0.57	ug/m3	0.19	1	02/27/15 08:34	02/27/15 15:44	179601-23-1		
o-Xylene	0.22	ug/m3	0.096	1	02/27/15 08:34	02/27/15 15:44	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	100	%.		1	02/27/15 08:34	02/27/15 15:44	3114-55-4		

HUG
16 April 2015

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-02-RV-PS-20150220		Lab ID: 60188508002	Collected: 02/20/15 12:07	Received: 02/24/15 09:40	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	156-60-5	
Ethylbenzene	0.18 <i>u</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:16	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:16	127-18-4	
Trichloroethene	0.41	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:16	79-01-6	
1,2,4-Trimethylbenzene	0.28 <i>u</i>	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:16	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:16	108-67-8	
Vinyl chloride	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	75-01-4	
m&p-Xylene	0.46 <i>u</i>	ug/m3	0.19	1	02/27/15 08:34	02/27/15 16:16	179601-23-1	
o-Xylene	0.18 <i>u</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:16	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	111	%		1	02/27/15 08:34	02/27/15 16:16	3114-55-4	

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16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-03-RV-PS-20150220 Lab ID: 60188508003 Collected: 02/20/15 12:32 Received: 02/24/15 09:40 Matrix: Air

Comments: • Sample was extracted three days outside the recommended extraction period for TO17 Passive.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
Benzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	71-43-2	CL
cis-1,2-Dichloroethene	ND	ug/m3	0.19	1	03/16/15 09:15	03/18/15 10:40	156-59-2	CL,L2
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	156-60-5	CL,L2
Ethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	100-41-4	L2
Isopropylbenzene (Cumene)	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	1634-04-4	CL,L2
Tetrachloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	127-18-4	
Toluene	0.24	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	108-88-3	CL,L2
Trichloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	79-01-6	CL,L2
1,2,4-Trimethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	108-67-8	
Vinyl chloride	ND	ug/m3	0.62	1	03/16/15 09:15	03/18/15 10:40	75-01-4	CL,L2
m&p-Xylene	ND	ug/m3	0.19	1	03/16/15 09:15	03/18/15 10:40	179601-23-1	L2
o-Xylene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 10:40	95-47-6	L2
Surrogates								
a,a,a-Trifluorotoluene (S)	49	%	38-150	1	03/16/15 09:15	03/18/15 10:40	98-08-8	

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16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-04-RV-PS-20150220	Lab ID: 60188508004	Collected: 02/20/15 12:50	Received: 02/24/15 09:40	Matrix: Air				
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	156-60-5	
Ethylbenzene	0.19 <i>u</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:48	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:48	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:48	79-01-6	
1,2,4-Trimethylbenzene	0.31 <i>u</i>	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:48	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 16:48	108-67-8	
Vinyl chloride	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	75-01-4	
m&p-Xylene	0.53 <i>y</i>	ug/m3	0.19	1	02/27/15 08:34	02/27/15 16:48	179601-23-1	
o-Xylene	0.20 <i>y</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 16:48	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	111	%		1	02/27/15 08:34	02/27/15 16:48	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60188508

Sample: WAA-05-RV-PS-20150220		Lab ID: 60188508005	Collected: 02/20/15 12:20	Received: 02/24/15 09:40	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	156-60-5	
Ethylbenzene	0.19 <i>u</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 17:20	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 17:20	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 17:20	79-01-6	
1,2,4-Trimethylbenzene	0.26 <i>u</i>	ug/m3	0.24	1	02/27/15 08:34	02/27/15 17:20	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 17:20	108-67-8	
Vinyl chloride	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	75-01-4	
m&p-Xylene	0.52 <i>u</i>	ug/m3	0.19	1	02/27/15 08:34	02/27/15 17:20	179601-23-1	
o-Xylene	0.20 <i>u</i>	ug/m3	0.096	1	02/27/15 08:34	02/27/15 17:20	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	116	%.		1	02/27/15 08:34	02/27/15 17:20	3114-55-4	

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16 Am 17*

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-04-RV-DU-20150220 Lab ID: 60188508006 Collected: 02/20/15 12:50 Received: 02/24/15 09:40 Matrix: Air

Comments: • Sample was extracted three days outside the recommended extraction period for TO17 Passive.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
Benzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	71-43-2	CL
cis-1,2-Dichloroethene	ND	ug/m3	0.19	1	03/16/15 09:15	03/18/15 11:05	156-59-2	CL,L2
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	156-60-5	CL,L2
Ethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	100-41-4	L2
Isopropylbenzene (Cumene)	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	1634-04-4	CL,L2
Tetrachloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	127-18-4	
Toluene	0.20	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	108-88-3	CL,L2
Trichloroethene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	79-01-6	CL,L2
1,2,4-Trimethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	108-67-8	
Vinyl chloride	ND	ug/m3	0.62	1	03/16/15 09:15	03/18/15 11:05	75-01-4	CL,L2
m&p-Xylene	ND	ug/m3	0.19	1	03/16/15 09:15	03/18/15 11:05	179601-23-1	L2
o-Xylene	ND	ug/m3	0.096	1	03/16/15 09:15	03/18/15 11:05	95-47-6	L2
Surrogates								
a,a,a-Trifluorotoluene (S)	46	%.	38-150	1	03/16/15 09:15	03/18/15 11:05	98-08-8	

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16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Sample: WAA-00-RV-TB-20150220		Lab ID: 60188508007		Collected: 02/20/15 13:10		Received: 02/24/15 09:40		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	156-60-5		
Ethylbenzene	0.14	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 14:24	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	1634-04-4		
Tetrachloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 14:24	127-18-4		
Trichloroethene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 14:24	79-01-6		
1,2,4-Trimethylbenzene	0.34	ug/m3	0.24	1	02/27/15 08:34	02/27/15 14:24	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	02/27/15 08:34	02/27/15 14:24	108-67-8		
Vinyl chloride	ND	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	75-01-4		
m&p-Xylene	0.39	ug/m3	0.19	1	02/27/15 08:34	02/27/15 14:24	179601-23-1		
o-Xylene	0.12	ug/m3	0.096	1	02/27/15 08:34	02/27/15 14:24	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	110	%		1	02/27/15 08:34	02/27/15 14:24	3114-55-4		

HUE
16 Apr 15

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

QC Batch: AIR/22603

Analysis Method: TO-17M

QC Batch Method: TO-17M

Analysis Description: TO17 MSS AIR

Associated Lab Samples: 60188508001, 60188508002, 60188508004, 60188508005, 60188508007

METHOD BLANK: 1908303

Matrix: Air

Associated Lab Samples: 60188508001, 60188508002, 60188508004, 60188508005, 60188508007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	02/27/15 11:02	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	02/27/15 11:02	
cis-1,2-Dichloroethene	ug/m3	ND	0.096	02/27/15 11:02	
Ethylbenzene	ug/m3	ND	0.096	02/27/15 11:02	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	02/27/15 11:02	
m&p-Xylene	ug/m3	ND	0.19	02/27/15 11:02	
Methyl-tert-butyl ether	ug/m3	ND	0.096	02/27/15 11:02	
o-Xylene	ug/m3	ND	0.096	02/27/15 11:02	
Tetrachloroethene	ug/m3	ND	0.24	02/27/15 11:02	
trans-1,2-Dichloroethene	ug/m3	ND	0.096	02/27/15 11:02	
Trichloroethene	ug/m3	ND	0.24	02/27/15 11:02	
Vinyl chloride	ug/m3	ND	0.096	02/27/15 11:02	
Chlorobenzene-d5 (S)	%.	99		02/27/15 11:02	

LABORATORY CONTROL SAMPLE: 1908304

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.15	.16J	103	72-137	
1,3,5-Trimethylbenzene	ug/m3	.15	.15J	101	73-134	
cis-1,2-Dichloroethene	ug/m3	.1	0.11	106	70-139	
Ethylbenzene	ug/m3	.11	0.12	106	63-140	
Isopropylbenzene (Cumene)	ug/m3	.13	.14J	108	75-135	
m&p-Xylene	ug/m3	.22	0.24	106	65-137	
Methyl-tert-butyl ether	ug/m3	.082	.091J	111	41-150	
o-Xylene	ug/m3	.12	0.12	104	64-139	
Tetrachloroethene	ug/m3	.18	.19J	106	64-141	
trans-1,2-Dichloroethene	ug/m3	.1	0.11	108	70-130	
Trichloroethene	ug/m3	.14	.14J	104	73-136	
Vinyl chloride	ug/m3	.067	.078J	116	59-150	
Chlorobenzene-d5 (S)	%.			99		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

QC Batch: AIR/22740

Analysis Method: TO-17M

QC Batch Method: TO-17M

Analysis Description: TO17 MSS AIR

Associated Lab Samples: 60188508003, 60188508006

METHOD BLANK: 1918758

Matrix: Air

Associated Lab Samples: 60188508003, 60188508006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.096	03/18/15 10:15	
1,3,5-Trimethylbenzene	ug/m3	ND	0.096	03/18/15 10:15	
Benzene	ug/m3	ND	0.096	03/18/15 10:15	CL
cis-1,2-Dichloroethene	ug/m3	ND	0.19	03/18/15 10:15	CL,L2
Ethylbenzene	ug/m3	ND	0.096	03/18/15 10:15	L2
Isopropylbenzene (Cumene)	ug/m3	ND	0.096	03/18/15 10:15	
m&p-Xylene	ug/m3	ND	0.19	03/18/15 10:15	L2
Methyl-tert-butyl ether	ug/m3	ND	0.096	03/18/15 10:15	CL,L2
o-Xylene	ug/m3	ND	0.096	03/18/15 10:15	L2
Tetrachloroethene	ug/m3	ND	0.096	03/18/15 10:15	
Toluene	ug/m3	ND	0.096	03/18/15 10:15	CL,L2
trans-1,2-Dichloroethene	ug/m3	ND	0.096	03/18/15 10:15	CL,L2
Trichloroethene	ug/m3	ND	0.096	03/18/15 10:15	CL
Vinyl chloride	ug/m3	ND	0.62	03/18/15 10:15	CL,L2
a,a,a-Trifluorotoluene (S)	%	53	38-150	03/18/15 10:15	

LABORATORY CONTROL SAMPLE & LCSD: 1918759

1918760

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.099	.093J	80.2	93	80	53-125		30	
1,3,5-Trimethylbenzene	ug/m3	.099	.086J	74.9	87	74	61-125		30	
Benzene	ug/m3	.062	ND	20.0	47	32	30-150		30	CL,R1
cis-1,2-Dichloroethene	ug/m3	.064	ND	11.9	34	18	30-150		30	CL,L0,R1
Ethylbenzene	ug/m3	.073	.048J	41.3	66	56	62-135		30	L0
Isopropylbenzene (Cumene)	ug/m3	.085	.066J	57.3	78	66	63-135		30	
m&p-Xylene	ug/m3	.15	.095J	85.0	62	55	61-128		30	L0
Methyl-tert-butyl ether	ug/m3	.076	ND	8.4	20	11	30-150		30	CL,L0,R1
o-Xylene	ug/m3	.071	.042J	37.3	59	52	60-125		30	L0
Tetrachloroethene	ug/m3	.084	.063J	51.4	75	60	54-139		30	
Toluene	ug/m3	.067	.038J	30.2	56	44	58-134		30	CL,L0
trans-1,2-Dichloroethene	ug/m3	.064	ND	7.8	23	12	30-150		30	CL,L0,R1
Trichloroethene	ug/m3	.072	.045J	34.2	63	47	40-150		30	CL
Vinyl chloride	ug/m3	.16	ND	8.3	10	5	30-150		30	CL,L0,R1
a,a,a-Trifluorotoluene (S)	%				58	40	38-150		30	S0

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

CL The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased low.

L0 Analyte recovery in the laboratory control sample (LCS) was outside QC limits.

L2 Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.

R1 RPD value was outside control limits.

S0 Surrogate recovery outside laboratory control limits.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WEST LAKE LANDFILL

Pace Project No.: 60188508

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60188508001	WAA-01-RV-PS-20150220	TO-17M	AIR/22603	TO-17M	AIR/22604
60188508002	WAA-02-RV-PS-20150220	TO-17M	AIR/22603	TO-17M	AIR/22604
60188508004	WAA-04-RV-PS-20150220	TO-17M	AIR/22603	TO-17M	AIR/22604
60188508005	WAA-05-RV-PS-20150220	TO-17M	AIR/22603	TO-17M	AIR/22604
60188508007	WAA-00-RV-TB-20150220	TO-17M	AIR/22603	TO-17M	AIR/22604
60188508003	WAA-03-RV-PS-20150220	TO-17M	AIR/22740	TO-17M	AIR/22741
60188508006	WAA-04-RV-DU-20150220	TO-17M	AIR/22740	TO-17M	AIR/22741

REPORT OF LABORATORY ANALYSIS

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Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: Pace Analytical Services, Inc. (Lenexa, Kansas)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 16, 2015

Sample Delivery Group (SDG): 60189050

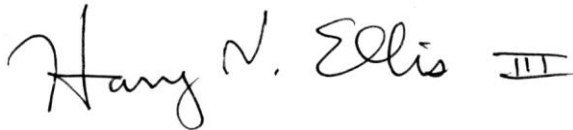
Sample Numbers: WAA-01-RV-PS-20150227, WAA-02-RV-PS-20150227,
WAA-03-RV-PS-20150227, WAA-04-RV-PS-20150227,
WAA-04-RV-DU-20150227, WAA-05-RV-PS-20150227, and
WAA-00-RV-TB-20150228

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



16 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60189050 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank. The field blank yielded low concentrations of five aromatic hydrocarbons, similar to the results in SDG No. 60188508. No analytes were detected in the field samples so no qualifications were applied.

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

All surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

March 24, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60189050

Dear Emily Fisher:

Enclosed are the analytical results for sample(s) received by the laboratory on March 04, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alaska Certification #: UST-078

Alaska Certification #MN00064

Alabama Certification #40770

Arizona Certification #: AZ-0014

Arkansas Certification #: 88-0680

California Certification #: 01155CA

Colorado Certification #Pace

Connecticut Certification #: PH-0256

EPA Region 8 Certification #: 8TMS-L

Florida/NELAP Certification #: E87605

Guam Certification #: 14-008r

Georgia Certification #: 959

Georgia EPD #: Pace

Idaho Certification #: MN00064

Hawaii Certification #MN00064

Illinois Certification #: 200011

Indiana Certification#C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky Dept of Envi. Protection - DW #90062

Kentucky Dept of Envi. Protection - WW #:90062

Louisiana DEQ Certification #: 3086

Louisiana DHH #: LA140001

Maine Certification #: 2013011

Maryland Certification #: 322

Michigan DEPH Certification #: 9909

Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace

Montana Certification #: MT0092

Nevada Certification #: MN_00064

Nebraska Certification #: Pace

New Jersey Certification #: MN-002

New York Certification #: 11647

North Carolina Certification #: 530

North Carolina State Public Health #: 27700

North Dakota Certification #: R-036

Ohio EPA #: 4150

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507

Oregon Certification #: MN200001

Oregon Certification #: MN300001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification

Saipan (CNMI) #:MP0003

South Carolina #:74003001

Texas Certification #: T104704192

Tennessee Certification #: 02818

Utah Certification #: MN000642013-4

Virginia DGS Certification #: 251

Virginia/VELAP Certification #: Pace

Washington Certification #: C486

West Virginia Certification #: 382

West Virginia DHHR #:9952C

Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60189050001	WAA-01-RV-PS-201502227	Air	02/27/15 12:13	03/04/15 10:40
60189050002	WAA-02-RV-PS-201502227	Air	02/27/15 11:24	03/04/15 10:40
60189050003	WAA-03-RV-PS-201502227	Air	02/27/15 11:50	03/04/15 10:40
60189050004	WAA-04-RV-PS-201502227	Air	02/27/15 12:03	03/04/15 10:40
60189050005	WAA-05-RV-PS-201502227	Air	02/27/15 11:37	03/04/15 10:40
60189050006	WAA-04-RV-DU-201502227	Air	02/27/15 12:03	03/04/15 10:40
60189050007	WAA-00-RV-TB-201502227	Air	02/27/15 12:20	03/04/15 10:40

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60189050001	WAA-01-RV-PS-201502227	TO-17M	RTP	13	PASI-M
60189050002	WAA-02-RV-PS-201502227	TO-17M	RTP	13	PASI-M
60189050003	WAA-03-RV-PS-201502227	TO-17M	RTP	13	PASI-M
60189050004	WAA-04-RV-PS-201502227	TO-17M	RTP	13	PASI-M
60189050005	WAA-05-RV-PS-201502227	TO-17M	RTP	13	PASI-M
60189050006	WAA-04-RV-DU-201502227	TO-17M	RTP	13	PASI-M
60189050007	WAA-00-RV-TB-201502227	TO-17M	RTP	13	PASI-M

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60189050

Sample: WAA-01-RV-PS-201502227 Lab ID: 60189050001 Collected: 02/27/15 12:13 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 13:39	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 13:39	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 13:39	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 13:39	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 13:39	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 13:39	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 13:39	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	85	%	70-130	4.21	03/19/15 07:14	03/19/15 13:39	3114-55-4	

HVE
16 April 2015

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-02-RV-PS-201502227 Lab ID: 60189050002 Collected: 02/27/15 11:24 Received: 03/04/15 10:40 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:10	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:10	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:10	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:10	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:10	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 14:10	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:10	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	92	%	70-130	4.21	03/19/15 07:14	03/19/15 14:10	3114-55-4	

WUE
16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-03-RV-PS-201502227 Lab ID: 60189050003 Collected: 02/27/15 11:50 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:45	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:45	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:45	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:45	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 14:45	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 14:45	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 14:45	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	90	%	70-130	4.21	03/19/15 07:14	03/19/15 14:45	3114-55-4	

HVK
16 Apr 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-04-RV-PS-201502227 Lab ID: 60189050004 Collected: 02/27/15 12:03 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:16	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:16	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:16	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:16	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:16	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 15:16	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:16	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	93	%	70-130	4.21	03/19/15 07:14	03/19/15 15:16	3114-55-4	

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16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-05-RV-PS-201502227 Lab ID: 60189050005 Collected: 02/27/15 11:37 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:47	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:47	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:47	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:47	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 15:47	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 15:47	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 15:47	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	94	%	70-130	4.21	03/19/15 07:14	03/19/15 15:47	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-04-RV-DU-201502227 Lab ID: 60189050006 Collected: 02/27/15 12:03 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 16:18	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 16:18	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 16:18	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 16:18	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 16:18	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 16:18	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 16:18	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	98	%	70-130	4.21	03/19/15 07:14	03/19/15 16:18	3114-55-4	

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16 Apr 15

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Sample: WAA-00-RV-TB-201502227 Lab ID: 60189050007 Collected: 02/27/15 12:20 Received: 03/04/15 10:40 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	156-60-5	
Ethylbenzene	0.22	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	100-41-4	
Isopropylbenzene (Cumene)	0.72	ug/m3	0.24	1	03/19/15 07:14	03/19/15 12:41	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 12:41	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 12:41	79-01-6	
1,2,4-Trimethylbenzene	0.48	ug/m3	0.24	1	03/19/15 07:14	03/19/15 12:41	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 12:41	108-67-8	
Vinyl chloride	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	75-01-4	
m&p-Xylene	1.0	ug/m3	0.19	1	03/19/15 07:14	03/19/15 12:41	179601-23-1	
o-Xylene	0.46	ug/m3	0.096	1	03/19/15 07:14	03/19/15 12:41	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	84	%	70-130	1	03/19/15 07:14	03/19/15 12:41	3114-55-4	

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16 Apr 15

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

QC Batch: AIR/22767 Analysis Method: TO-17M
QC Batch Method: TO-17M Analysis Description: TO17 MSS AIR
Associated Lab Samples: 60189050001, 60189050002, 60189050003, 60189050004, 60189050005, 60189050006, 60189050007

METHOD BLANK: 1921104 Matrix: Air
Associated Lab Samples: 60189050001, 60189050002, 60189050003, 60189050004, 60189050005, 60189050006, 60189050007

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	03/19/15 12:07	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	03/19/15 12:07	
cis-1,2-Dichloroethene	ug/m3	ND	0.096	03/19/15 12:07	
Ethylbenzene	ug/m3	ND	0.096	03/19/15 12:07	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	03/19/15 12:07	
m&p-Xylene	ug/m3	ND	0.19	03/19/15 12:07	
Methyl-tert-butyl ether	ug/m3	ND	0.096	03/19/15 12:07	
o-Xylene	ug/m3	ND	0.096	03/19/15 12:07	
Tetrachloroethene	ug/m3	ND	0.24	03/19/15 12:07	
trans-1,2-Dichloroethene	ug/m3	ND	0.096	03/19/15 12:07	
Trichloroethene	ug/m3	ND	0.24	03/19/15 12:07	
Vinyl chloride	ug/m3	ND	0.096	03/19/15 12:07	
Chlorobenzene-d5 (S)	%.	82	70-130	03/19/15 12:07	

LABORATORY CONTROL SAMPLE: 1921105

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.15	.18J	116	72-137	
1,3,5-Trimethylbenzene	ug/m3	.15	.18J	116	73-134	
cis-1,2-Dichloroethene	ug/m3	.1	0.11	108	70-139	
Ethylbenzene	ug/m3	.12	0.14	124	63-140	
Isopropylbenzene (Cumene)	ug/m3	.13	.16J	123	75-135	
m&p-Xylene	ug/m3	.22	0.27	123	65-137	
Methyl-tert-butyl ether	ug/m3	.082	0.098	119	41-150	
o-Xylene	ug/m3	.12	0.15	122	64-139	
Tetrachloroethene	ug/m3	.18	.21J	117	64-141	
trans-1,2-Dichloroethene	ug/m3	.1	0.11	109	70-130	
Trichloroethene	ug/m3	.14	.14J	102	73-136	
Vinyl chloride	ug/m3	.067	.07J	105	59-150	
Chlorobenzene-d5 (S)	%.			84	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WEST LAKE LANDFILL

Pace Project No.: 60189050

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60189050001	WAA-01-RV-PS-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050002	WAA-02-RV-PS-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050003	WAA-03-RV-PS-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050004	WAA-04-RV-PS-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050005	WAA-05-RV-PS-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050006	WAA-04-RV-DU-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768
60189050007	WAA-00-RV-TB-201502227	TO-17M	AIR/22767	TO-17M	AIR/22768

REPORT OF LABORATORY ANALYSIS

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Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: Pace Analytical Services, Inc. (Lenexa, Kansas)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 16, 2015

Sample Delivery Group (SDG): 60189577

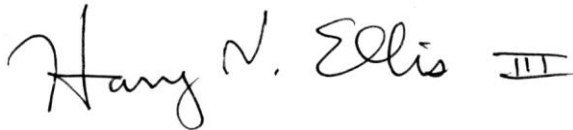
Sample Numbers: WAA-01-RV-PS-20150306, WAA-02-RV-PS-20150306,
WAA-03-RV-PS-20150306, WAA-04-RV-PS-20150306,
WAA-04-RV-DU-20150306, WAA-05-RV-PS-20150306, and
WAA-00-RV-TB-20150306

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



16 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60189509 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank or the field (trip) blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

Due to laboratory error, three samples were not spiked with the surrogate solution. All other surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

March 23, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60189577

Dear Emily Fisher:

Enclosed are the analytical results for sample(s) received by the laboratory on March 10, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alaska Certification #: UST-078

Alaska Certification #MN00064

Alabama Certification #40770

Arizona Certification #: AZ-0014

Arkansas Certification #: 88-0680

California Certification #: 01155CA

Colorado Certification #Pace

Connecticut Certification #: PH-0256

EPA Region 8 Certification #: 8TMS-L

Florida/NELAP Certification #: E87605

Guam Certification #: 14-008r

Georgia Certification #: 959

Georgia EPD #: Pace

Idaho Certification #: MN00064

Hawaii Certification #MN00064

Illinois Certification #: 200011

Indiana Certification#C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky Dept of Envi. Protection - DW #90062

Kentucky Dept of Envi. Protection - WW #:90062

Louisiana DEQ Certification #: 3086

Louisiana DHH #: LA140001

Maine Certification #: 2013011

Maryland Certification #: 322

Michigan DEPH Certification #: 9909

Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace

Montana Certification #: MT0092

Nevada Certification #: MN_00064

Nebraska Certification #: Pace

New Jersey Certification #: MN-002

New York Certification #: 11647

North Carolina Certification #: 530

North Carolina State Public Health #: 27700

North Dakota Certification #: R-036

Ohio EPA #: 4150

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507

Oregon Certification #: MN200001

Oregon Certification #: MN300001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification

Saipan (CNMI) #:MP0003

South Carolina #:74003001

Texas Certification #: T104704192

Tennessee Certification #: 02818

Utah Certification #: MN000642013-4

Virginia DGS Certification #: 251

Virginia/VELAP Certification #: Pace

Washington Certification #: C486

West Virginia Certification #: 382

West Virginia DHHR #:9952C

Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60189577001	WAA-01-RV-PS-20150306	Air	03/06/15 11:27	03/10/15 10:30
60189577002	WAA-02-RV-PS-20150306	Air	03/06/15 10:52	03/10/15 10:30
60189577003	WAA-03-RV-PS-20150306	Air	03/06/15 11:10	03/10/15 10:30
60189577004	WAA-04-RV-PS-20150306	Air	03/06/15 11:20	03/10/15 10:30
60189577005	WAA-05-RV-PS-20150306	Air	03/06/15 10:59	03/10/15 10:30
60189577006	WAA-04-RV-DU-20150306	Air	03/06/15 11:20	03/10/15 10:30
60189577007	WAA-00-RV-TB-20150306	Air	03/06/15 11:35	03/10/15 10:30

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60189577001	WAA-01-RV-PS-20150306	TO-17M	RTP	13	PASI-M
60189577002	WAA-02-RV-PS-20150306	TO-17M	RTP	13	PASI-M
60189577003	WAA-03-RV-PS-20150306	TO-17M	RTP	13	PASI-M
60189577004	WAA-04-RV-PS-20150306	TO-17M	RTP	13	PASI-M
60189577005	WAA-05-RV-PS-20150306	TO-17M	RTP	13	PASI-M
60189577006	WAA-04-RV-DU-20150306	TO-17M	RTP	13	PASI-M
60189577007	WAA-00-RV-TB-20150306	TO-17M	RTP	13	PASI-M

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-01-RV-PS-20150306		Lab ID: 60189577001		Collected: 03/06/15 11:27		Received: 03/10/15 10:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	156-60-5		
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 17:52	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 17:52	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 17:52	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 17:52	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 17:52	108-67-8		
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	75-01-4		
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 17:52	179601-23-1		
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 17:52	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	94	%	70-130	4.21	03/19/15 07:14	03/19/15 17:52	3114-55-4		

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-02-RV-PS-20150306		Lab ID: 60189577002	Collected: 03/06/15 10:52		Received: 03/10/15 10:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:23	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:23	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:23	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:23	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:23	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	75-01-4	
m&p-Xylene	ND	ug/m3	0.80	4.21	03/19/15 07:14	03/19/15 18:23	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:23	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	96	%	70-130	4.21	03/19/15 07:14	03/19/15 18:23	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-03-RV-PS-20150306		Lab ID: 60189577003	Collected: 03/06/15 11:10	Received: 03/10/15 10:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:54	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:54	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:54	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:54	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/19/15 18:54	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/19/15 18:54	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/19/15 18:54	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	98	%	70-130	4.21	03/19/15 07:14	03/19/15 18:54	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-04-RV-PS-20150306		Lab ID: 60189577004	Collected: 03/06/15 11:20	Received: 03/10/15 10:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:26	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:26	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:26	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:26	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:26	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	75-01-4	
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/20/15 07:26	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:26	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	0	%	70-130	4.21	03/19/15 07:14	03/20/15 07:26	3114-55-4	1e

*Lab error -
unspiked*

*HUE
16 Apr 15*

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-05-RV-PS-20150306		Lab ID: 60189577005	Collected: 03/06/15 10:59	Received: 03/10/15 10:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:57	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:57	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:57	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:57	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 07:57	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	75-01-4	
m&p-Xylene	ND	ug/m3	0.80	4.21	03/19/15 07:14	03/20/15 07:57	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 07:57	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	0	%	70-130	4.21	03/19/15 07:14	03/20/15 07:57	3114-55-4	1e

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-04-RV-DU-20150306		Lab ID: 60189577006		Collected: 03/06/15 11:20		Received: 03/10/15 10:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	156-60-5		
Ethylbenzene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 08:28	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 08:28	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 08:28	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 08:28	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/19/15 07:14	03/20/15 08:28	108-67-8		
Vinyl chloride	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	75-01-4		
m&p-Xylene	ND	ug/m3	0.81	4.21	03/19/15 07:14	03/20/15 08:28	179601-23-1		
o-Xylene	ND	ug/m3	0.40	4.21	03/19/15 07:14	03/20/15 08:28	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	0	%	70-130	4.21	03/19/15 07:14	03/20/15 08:28	3114-55-4	1e	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Sample: WAA-00-RV-TB-20150306		Lab ID: 60189577007		Collected: 03/06/15 11:35		Received: 03/10/15 10:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	156-60-5		
Ethylbenzene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 17:05	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	1634-04-4		
Tetrachloroethene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 17:05	127-18-4		
Trichloroethene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 17:05	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 17:05	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	03/19/15 07:14	03/19/15 17:05	108-67-8		
Vinyl chloride	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	75-01-4		
m&p-Xylene	ND	ug/m3	0.19	1	03/19/15 07:14	03/19/15 17:05	179601-23-1		
o-Xylene	ND	ug/m3	0.096	1	03/19/15 07:14	03/19/15 17:05	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	94	%	70-130	1	03/19/15 07:14	03/19/15 17:05	3114-55-4		

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16 Apr 15

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

QC Batch:	AIR/22767	Analysis Method:	TO-17M
QC Batch Method:	TO-17M	Analysis Description:	TO17 MSS AIR
Associated Lab Samples: 60189577001, 60189577002, 60189577003, 60189577004, 60189577005, 60189577006, 60189577007			

METHOD BLANK:	1921104	Matrix:	Air
Associated Lab Samples: 60189577001, 60189577002, 60189577003, 60189577004, 60189577005, 60189577006, 60189577007			

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	03/19/15 12:07	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	03/19/15 12:07	
cis-1,2-Dichloroethene	ug/m3	ND	0.096	03/19/15 12:07	
Ethylbenzene	ug/m3	ND	0.096	03/19/15 12:07	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	03/19/15 12:07	
m&p-Xylene	ug/m3	ND	0.19	03/19/15 12:07	
Methyl-tert-butyl ether	ug/m3	ND	0.096	03/19/15 12:07	
o-Xylene	ug/m3	ND	0.096	03/19/15 12:07	
Tetrachloroethene	ug/m3	ND	0.24	03/19/15 12:07	
trans-1,2-Dichloroethene	ug/m3	ND	0.096	03/19/15 12:07	
Trichloroethene	ug/m3	ND	0.24	03/19/15 12:07	
Vinyl chloride	ug/m3	ND	0.096	03/19/15 12:07	
Chlorobenzene-d5 (S)	%.	82	70-130	03/19/15 12:07	

LABORATORY CONTROL SAMPLE: 1921105

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.15	.18J	116	72-137	
1,3,5-Trimethylbenzene	ug/m3	.15	.18J	116	73-134	
cis-1,2-Dichloroethene	ug/m3	.1	0.11	108	70-139	
Ethylbenzene	ug/m3	.12	0.14	124	63-140	
Isopropylbenzene (Cumene)	ug/m3	.13	.16J	123	75-135	
m&p-Xylene	ug/m3	.22	0.27	123	65-137	
Methyl-tert-butyl ether	ug/m3	.082	0.098	119	41-150	
o-Xylene	ug/m3	.12	0.15	122	64-139	
Tetrachloroethene	ug/m3	.18	.21J	117	64-141	
trans-1,2-Dichloroethene	ug/m3	.1	0.11	109	70-130	
Trichloroethene	ug/m3	.14	.14J	102	73-136	
Vinyl chloride	ug/m3	.067	.07J	105	59-150	
Chlorobenzene-d5 (S)	%.			84	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

1e Surrogate standard was not added to this sample tube due to instrument error. The addition of a surrogate standard is not required per the TO17 method.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE


Project: WEST LAKE LANDFILL

Pace Project No.: 60189577

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60189577001	WAA-01-RV-PS-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577002	WAA-02-RV-PS-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577003	WAA-03-RV-PS-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577004	WAA-04-RV-PS-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577005	WAA-05-RV-PS-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577006	WAA-04-RV-DU-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768
60189577007	WAA-00-RV-TB-20150306	TO-17M	AIR/22767	TO-17M	AIR/22768

REPORT OF LABORATORY ANALYSIS

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	Document Name:	Document Revised: 26Dec2013
	Air Sample Condition Upon Receipt	Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt Client Name: Pace KS Project #: **WO#: 60189577**

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client
☐ Commercial ☐ Pace ☐ Other: _____

Tracking Number: 7730 7827 6296

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No Seals Intact? ☒ Yes ☐ No

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other: _____ Temp Blank rec: ☒ Yes ☐ No

Temp. (TO17 and TO13 samples only) (°C): 4.0 Corrected Temp (°C): 4.1 Thermom. Used: ☒ B88A912167504 ☐ B88A9132521491

Temp should be above freezing to 6°C Correction Factor: to 1 Date & Initials of Person Examining Contents: 3/10/15

Type of ice Received ☐ Blue ☒ Wet ☐ None

Comments:

Chain of Custody Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name and/or Signature on COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Media: <u>IDT</u>		11.
Sample Labels Match COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12.

Samples Received:					
Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION

Field Data Required? ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review:

Date: 3.12.15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: Pace Analytical Services, Inc. (Lenexa, Kansas)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 9, 2015

Sample Delivery Group (SDG): 60190027

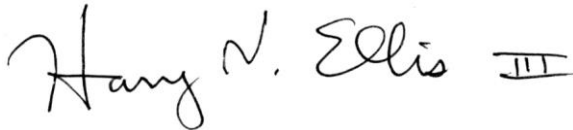
Sample Numbers: WAA-01-RV-PS-20150313, WAA-02-RV-PS-20150313, WAA-03-RV-PS-20150313, WAA-04-RV-PS-20150313, WAA-04-RV-DU-20150313, WAA-05-RV-PS-20150313, and WAA-00-RV-TB-20150313

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



9 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60190027 included five (5) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank and the field blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

All surrogate recoveries were within QC limits. No qualifications were applied.

VI. Comments

One analyte was detected in two field samples and the field duplicate, slightly above the reporting limit. It may be present in the other samples at a concentration below the reporting limit.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

March 27, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60190027

Dear Emily Fisher:

Enclosed are the analytical results for sample(s) received by the laboratory on March 18, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alaska Certification #: UST-078

Alaska Certification #MN00064

Alabama Certification #40770

Arizona Certification #: AZ-0014

Arkansas Certification #: 88-0680

California Certification #: 01155CA

Colorado Certification #Pace

Connecticut Certification #: PH-0256

EPA Region 8 Certification #: 8TMS-L

Florida/NELAP Certification #: E87605

Guam Certification #: 14-008r

Georgia Certification #: 959

Georgia EPD #: Pace

Idaho Certification #: MN00064

Hawaii Certification #MN00064

Illinois Certification #: 200011

Indiana Certification#C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky Dept of Envi. Protection - DW #90062

Kentucky Dept of Envi. Protection - WW #:90062

Louisiana DEQ Certification #: 3086

Louisiana DHH #: LA140001

Maine Certification #: 2013011

Maryland Certification #: 322

Michigan DEPH Certification #: 9909

Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace

Montana Certification #: MT0092

Nevada Certification #: MN_00064

Nebraska Certification #: Pace

New Jersey Certification #: MN-002

New York Certification #: 11647

North Carolina Certification #: 530

North Carolina State Public Health #: 27700

North Dakota Certification #: R-036

Ohio EPA #: 4150

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507

Oregon Certification #: MN200001

Oregon Certification #: MN300001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification

Saipan (CNMI) #:MP0003

South Carolina #:74003001

Texas Certification #: T104704192

Tennessee Certification #: 02818

Utah Certification #: MN000642013-4

Virginia DGS Certification #: 251

Virginia/VELAP Certification #: Pace

Washington Certification #: C486

West Virginia Certification #: 382

West Virginia DHHR #:9952C

Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60190027001	WAA-01-RV-PS-20150313	Air	03/13/15 09:25	03/18/15 09:30
60190027002	WAA-02-RV-PS-20150313	Air	03/13/15 09:32	03/18/15 09:30
60190027003	WAA-03-RV-PS-20150313	Air	03/13/15 09:54	03/18/15 09:30
60190027004	WAA-04-RV-PS-20150313	Air	03/13/15 10:06	03/18/15 09:30
60190027005	WAA-05-RV-PS-20150313	Air	03/13/15 09:44	03/18/15 09:30
60190027006	WAA-04-RV-DU-20150313	Air	03/13/15 10:06	03/18/15 09:30
60190027007	WAA-00-RV-TB-20150313	Air	03/13/15 10:30	03/18/15 09:30

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60190027001	WAA-01-RV-PS-20150313	TO-17M	RTP	13	PASI-M
60190027002	WAA-02-RV-PS-20150313	TO-17M	RTP	13	PASI-M
60190027003	WAA-03-RV-PS-20150313	TO-17M	RTP	13	PASI-M
60190027004	WAA-04-RV-PS-20150313	TO-17M	RTP	13	PASI-M
60190027005	WAA-05-RV-PS-20150313	TO-17M	RTP	13	PASI-M
60190027006	WAA-04-RV-DU-20150313	TO-17M	RTP	13	PASI-M
60190027007	WAA-00-RV-TB-20150313	TO-17M	RTP	13	PASI-M

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60190027

Sample: WAA-01-RV-PS-20150313		Lab ID: 60190027001	Collected: 03/13/15 09:25	Received: 03/18/15 09:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	156-60-5	
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:15	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:15	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:15	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:15	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:15	108-67-8	
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	75-01-4	
m&p-Xylene	ND	ug/m3	0.82	4.21	03/24/15 08:11	03/24/15 14:15	179601-23-1	
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:15	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	110	%.	70-130	4.21	03/24/15 08:11	03/24/15 14:15	3114-55-4	

HUG 9 April 2015

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Sample: WAA-02-RV-PS-20150313		Lab ID: 60190027002		Collected: 03/13/15 09:32		Received: 03/18/15 09:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive	Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	156-60-5		
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:46	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:46	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:46	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:46	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 14:46	108-67-8		
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	75-01-4		
m&p-Xylene	ND	ug/m3	0.83	4.21	03/24/15 08:11	03/24/15 14:46	179601-23-1		
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 14:46	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	97	%	70-130	4.21	03/24/15 08:11	03/24/15 14:46	3114-55-4		

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL
Pace Project No.: 60190027

Sample: WAA-03-RV-PS-20150313		Lab ID: 60190027003	Collected: 03/13/15 09:54	Received: 03/18/15 09:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	156-60-5	
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:17	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:17	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:17	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:17	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:17	108-67-8	
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	75-01-4	
m&p-Xylene	ND	ug/m3	0.83	4.21	03/24/15 08:11	03/24/15 15:17	179601-23-1	
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:17	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	99	%.	70-130	4.21	03/24/15 08:11	03/24/15 15:17	3114-55-4	

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Sample: WAA-04-RV-PS-20150313		Lab ID: 60190027004		Collected: 03/13/15 10:06		Received: 03/18/15 09:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	156-60-5		
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:48	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:48	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:48	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:48	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 15:48	108-67-8		
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	75-01-4		
m&p-Xylene	0.94	ug/m3	0.82	4.21	03/24/15 08:11	03/24/15 15:48	179601-23-1		
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 15:48	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	102	%	70-130	4.21	03/24/15 08:11	03/24/15 15:48	3114-55-4		

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Sample: WAA-05-RV-PS-20150313		Lab ID: 60190027005		Collected: 03/13/15 09:44		Received: 03/18/15 09:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	156-60-5		
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:19	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:19	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:19	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:19	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:19	108-67-8		
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	75-01-4		
m&p-Xylene	0.87	ug/m3	0.83	4.21	03/24/15 08:11	03/24/15 16:19	179601-23-1		
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:19	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	104	%	70-130	4.21	03/24/15 08:11	03/24/15 16:19	3114-55-4		

HVG 9 Apr 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Sample: WAA-04-RV-DU-20150313		Lab ID: 60190027006		Collected: 03/13/15 10:06		Received: 03/18/15 09:30		Matrix: Air	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M							
cis-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	156-59-2		
trans-1,2-Dichloroethene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	156-60-5		
Ethylbenzene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	100-41-4		
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:50	98-82-8		
Methyl-tert-butyl ether	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	1634-04-4		
Tetrachloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:50	127-18-4		
Trichloroethene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:50	79-01-6		
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:50	95-63-6		
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	03/24/15 08:11	03/24/15 16:50	108-67-8		
Vinyl chloride	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	75-01-4		
m&p-Xylene	0.87	ug/m3	0.82	4.21	03/24/15 08:11	03/24/15 16:50	179601-23-1		
o-Xylene	ND	ug/m3	0.41	4.21	03/24/15 08:11	03/24/15 16:50	95-47-6		
Surrogates									
Chlorobenzene-d5 (S)	106	%	70-130	4.21	03/24/15 08:11	03/24/15 16:50	3114-55-4		

AUE 9 Am 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Sample: WAA-00-RV-TB-20150313		Lab ID: 60190027007	Collected: 03/13/15 10:30	Received: 03/18/15 09:30	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	156-60-5	
Ethylbenzene	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.25	1	03/24/15 08:11	03/24/15 13:43	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.25	1	03/24/15 08:11	03/24/15 13:43	127-18-4	
Trichloroethene	ND	ug/m3	0.25	1	03/24/15 08:11	03/24/15 13:43	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.25	1	03/24/15 08:11	03/24/15 13:43	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.25	1	03/24/15 08:11	03/24/15 13:43	108-67-8	
Vinyl chloride	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	75-01-4	
m&p-Xylene	ND	ug/m3	0.20	1	03/24/15 08:11	03/24/15 13:43	179601-23-1	
o-Xylene	ND	ug/m3	0.098	1	03/24/15 08:11	03/24/15 13:43	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	107	%	70-130	1	03/24/15 08:11	03/24/15 13:43	3114-55-4	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

QC Batch:	AIR/22817	Analysis Method:	TO-17M
QC Batch Method:	TO-17M	Analysis Description:	TO17 MSS AIR
Associated Lab Samples:	60190027001, 60190027002, 60190027003, 60190027004, 60190027005, 60190027006, 60190027007		

METHOD BLANK:	1923911	Matrix:	Air
Associated Lab Samples:	60190027001, 60190027002, 60190027003, 60190027004, 60190027005, 60190027006, 60190027007		

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.25	03/24/15 09:32	
1,3,5-Trimethylbenzene	ug/m3	ND	0.25	03/24/15 09:32	
cis-1,2-Dichloroethene	ug/m3	ND	0.098	03/24/15 09:32	
Ethylbenzene	ug/m3	ND	0.098	03/24/15 09:32	
Isopropylbenzene (Cumene)	ug/m3	ND	0.25	03/24/15 09:32	
m&p-Xylene	ug/m3	ND	0.20	03/24/15 09:32	
Methyl-tert-butyl ether	ug/m3	ND	0.098	03/24/15 09:32	
o-Xylene	ug/m3	ND	0.098	03/24/15 09:32	
Tetrachloroethene	ug/m3	ND	0.25	03/24/15 09:32	
trans-1,2-Dichloroethene	ug/m3	ND	0.098	03/24/15 09:32	
Trichloroethene	ug/m3	ND	0.25	03/24/15 09:32	
Vinyl chloride	ug/m3	ND	0.098	03/24/15 09:32	
Chlorobenzene-d5 (S)	%.	95	70-130	03/24/15 09:32	

LABORATORY CONTROL SAMPLE: 1923912

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.16	.17J	107	72-137	
1,3,5-Trimethylbenzene	ug/m3	.16	.16J	101	73-134	
cis-1,2-Dichloroethene	ug/m3	.11	0.13	125	70-139	
Ethylbenzene	ug/m3	.12	0.13	112	63-140	
Isopropylbenzene (Cumene)	ug/m3	.13	.14J	109	75-135	
m&p-Xylene	ug/m3	.23	0.25	111	65-137	
Methyl-tert-butyl ether	ug/m3	.083	.093J	112	41-150	
o-Xylene	ug/m3	.12	0.13	105	64-139	
Tetrachloroethene	ug/m3	.18	.23J	127	64-141	
trans-1,2-Dichloroethene	ug/m3	.11	0.13	125	70-130	
Trichloroethene	ug/m3	.14	.15J	112	73-136	
Vinyl chloride	ug/m3	.068	.091J	134	59-150 CH	
Chlorobenzene-d5 (S)	%.			96	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

CH The continuing calibration for this compound is outside of Pace Analytical acceptance limits. The results may be biased high.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE


Project: WEST LAKE LANDFILL

Pace Project No.: 60190027

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60190027001	WAA-01-RV-PS-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027002	WAA-02-RV-PS-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027003	WAA-03-RV-PS-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027004	WAA-04-RV-PS-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027005	WAA-05-RV-PS-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027006	WAA-04-RV-DU-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818
60190027007	WAA-00-RV-TB-20150313	TO-17M	AIR/22817	TO-17M	AIR/22818

REPORT OF LABORATORY ANALYSIS

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	Document Name: Air Sample Condition Upon Receipt	Document Revised: 26Dec2013 Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

**Air Sample Condition
Upon Receipt**

Client Name:

John Tech / Pace KS

Project #:

WO# : 60190027



60190027

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client

☐ Commercial ☐ Pace ☐ Other: _____

Tracking Number: *773140033275*

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No

Seals Intact? ☒ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☒ Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other: _____

Temp Blank rec: ☒ Yes ☐ No

Temp. (TO17 and TO13 samples only) (°C): *5.8* Corrected Temp (°C): *5.8*

Thermom. Used: ☐ B88A912167504 ☐ 72337080

☒ B88A9132521491 ☐ 80512447

Temp should be above freezing to 6°C Correction Factor: *true*

Date & Initials of Person Examining Contents: *3/18/15*

Type of ice Received ☐ Blue ☒ Wet ☐ None

Comments:

Chain of Custody Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name and/or Signature on COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Media: <i>Passive</i>		11.
Sample Labels Match COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12.

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION

Field Data Required? ☐ Yes ☐ No

Person Contacted: _____

Date/Time: _____

Comments/Resolution: _____

Project Manager Review: _____

Date: *3.15.15*

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of 1

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company: Tetra Tech EMI		Report To: Emily Fisher		Attention: Emily Fisher	
Address: 415 Oak		Copy To:		Company Name: Tetra Tech	
Kansas City, MO 64106				Address: 415 Oak St, Kansas City, MO 64106	
Email To: Emily.Fisher@tetratech.com		Purchase Order No.: 1111499		Pace Quote Reference:	
Phone: (816) 412-1755 Fax:		Project Name: West Lake Landfill		Pace Project Manager: Sherri Rosenstangle	
Requested Due Date/TAT:		Project Number:		Pace Profile #: 970.8	
				REGULATORY AGENCY	
				<input type="checkbox"/> NPDES <input type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER <input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER	
				Site Location	
				STATE: MO	

ITEM #	Section D Required Client Information	Valid Matrix Codes MATRIX CODE DRINKING WATER DW WT WASTE WATER WW PRODUCT P SOIL/SOLID OL OIL WP WIPE AR AIR OT OTHER TS TISSUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED				TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Analysis Test ↓ TO-17 Passive	Requested Analysis Filtered (Y/N)										Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
					SAMPLING END DATE/TIME		SAMPLING END DATE/TIME						Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N			Y/N	Y/N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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1	WAA-01-RV-PS-20150313		AR		3/6/15	14:06	3/13/15	09:25	9799	9.4	163CY	X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						</

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Timothy Barbeau Tetra Tech	3/17/15	1345	Timothy Barbeau Pace	3/18/15	0930	5.8 4 4 4

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER: Timothy Barbeau					
SIGNATURE of SAMPLER: Timothy Barbeau					
DATE Signed (MM/DD/YY): 3/17/15					

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: Pace Analytical Services, Inc. (Lenexa, Kansas)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 16, 2015

Sample Delivery Group (SDG): 60191132

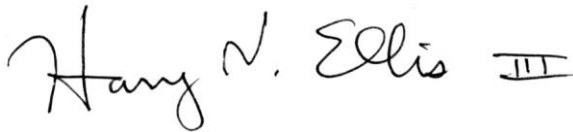
Sample Numbers: WAA-04-RV-PS-20150327, WAA-04-RV-DU-20150327, and
WAA-04-RV-TB-20150327

Matrix / Number of Samples: 1 Air Sample, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



16 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) 60191132 included one (1) environmental air (adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for selected volatile organic compounds via EPA Air Method TO-17. The following summarizes the data validation that was performed.

VOLATILE ORGANIC COMPOUND ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the established holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) blank or the field (trip) blank. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All LCS results were within QC limits. No qualifications were applied.

V. Surrogates

Due to laboratory error, two field samples were not spiked with the surrogate. All other surrogate recoveries (including those in previous SDG) were within QC limits. No qualifications were applied.

VI. Comments

No analytes were detected in the field samples.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

April 08, 2015

Emily Fisher
TETRA TECH EMI
415 Oak
Kansas City, MO 64106

RE: Project: WEST LAKE LANDFILL
Pace Project No.: 60191132

Dear Emily Fisher:

Enclosed are the analytical results for sample(s) received by the laboratory on April 01, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Emily Webb for
Sherri Rosenstangle
sherri.rosenstangle@pacelabs.com
Project Manager

Enclosures



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alaska Certification #: UST-078

Alaska Certification #MN00064

Alabama Certification #40770

Arizona Certification #: AZ-0014

Arkansas Certification #: 88-0680

California Certification #: 01155CA

Colorado Certification #Pace

Connecticut Certification #: PH-0256

EPA Region 8 Certification #: 8TMS-L

Florida/NELAP Certification #: E87605

Guam Certification #: 14-008r

Georgia Certification #: 959

Georgia EPD #: Pace

Idaho Certification #: MN00064

Hawaii Certification #MN00064

Illinois Certification #: 200011

Indiana Certification#C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky Dept of Envi. Protection - DW #90062

Kentucky Dept of Envi. Protection - WW #:90062

Louisiana DEQ Certification #: 3086

Louisiana DHH #: LA140001

Maine Certification #: 2013011

Maryland Certification #: 322

Michigan DEPH Certification #: 9909

Minnesota Certification #: 027-053-137

Mississippi Certification #: Pace

Montana Certification #: MT0092

Nevada Certification #: MN_00064

Nebraska Certification #: Pace

New Jersey Certification #: MN-002

New York Certification #: 11647

North Carolina Certification #: 530

North Carolina State Public Health #: 27700

North Dakota Certification #: R-036

Ohio EPA #: 4150

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507

Oregon Certification #: MN200001

Oregon Certification #: MN300001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification

Saipan (CNMI) #:MP0003

South Carolina #:74003001

Texas Certification #: T104704192

Tennessee Certification #: 02818

Utah Certification #: MN000642013-4

Virginia DGS Certification #: 251

Virginia/VELAP Certification #: Pace

Washington Certification #: C486

West Virginia Certification #: 382

West Virginia DHHR #:9952C

Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60191132001	WAA-04-RV-PS-20150327	Air	03/27/15 09:36	04/01/15 10:10
60191132002	WAA-04-RV-DU-20150327	Air	03/27/15 09:36	04/01/15 10:10
60191132003	WAA-04-RV-TB-20150327	Air	03/27/15 09:55	04/01/15 10:10

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60191132001	WAA-04-RV-PS-20150327	TO-17M	RTP	13	PASI-M
60191132002	WAA-04-RV-DU-20150327	TO-17M	RTP	13	PASI-M
60191132003	WAA-04-RV-TB-20150327	TO-17M	RTP	13	PASI-M

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Sample: WAA-04-RV-PS-20150327 Lab ID: 60191132001 Collected: 03/27/15 09:36 Received: 04/01/15 10:10 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:04	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:04	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:04	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:04	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:04	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	75-01-4	
m&p-Xylene	ND	ug/m3	0.80	4.21	04/02/15 08:51	04/02/15 14:04	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:04	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	0	%	70-130	4.21	04/02/15 08:51	04/02/15 14:04	3114-55-4	1e

unspiked -
Lab error

HUG
16 April 2015

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Sample: WAA-04-RV-DU-20150327		Lab ID: 60191132002	Collected: 03/27/15 09:36	Received: 04/01/15 10:10	Matrix: Air			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive		Analytical Method: TO-17M Preparation Method: TO-17M						
cis-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	156-60-5	
Ethylbenzene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:37	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	1634-04-4	
Tetrachloroethene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:37	127-18-4	
Trichloroethene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:37	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:37	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	1.0	4.21	04/02/15 08:51	04/02/15 14:37	108-67-8	
Vinyl chloride	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	75-01-4	
m&p-Xylene	ND	ug/m3	0.80	4.21	04/02/15 08:51	04/02/15 14:37	179601-23-1	
o-Xylene	ND	ug/m3	0.40	4.21	04/02/15 08:51	04/02/15 14:37	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	0	%	70-130	4.21	04/02/15 08:51	04/02/15 14:37	3114-55-4	1e

17UG
16 Apr 15

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

Sample: WAA-04-RV-TB-20150327 Lab ID: 60191132003 Collected: 03/27/15 09:55 Received: 04/01/15 10:10 Matrix: Air								
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO17M VOC MS AIR Passive Analytical Method: TO-17M Preparation Method: TO-17M								
cis-1,2-Dichloroethene	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	156-59-2	
trans-1,2-Dichloroethene	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	156-60-5	
Ethylbenzene	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	100-41-4	
Isopropylbenzene (Cumene)	ND	ug/m3	0.24	1	04/02/15 08:51	04/02/15 13:16	98-82-8	
Methyl-tert-butyl ether	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	1634-04-4	
Tetrachloroethene	ND	ug/m3	0.24	1	04/02/15 08:51	04/02/15 13:16	127-18-4	
Trichloroethene	ND	ug/m3	0.24	1	04/02/15 08:51	04/02/15 13:16	79-01-6	
1,2,4-Trimethylbenzene	ND	ug/m3	0.24	1	04/02/15 08:51	04/02/15 13:16	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	0.24	1	04/02/15 08:51	04/02/15 13:16	108-67-8	
Vinyl chloride	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	75-01-4	
m&p-Xylene	ND	ug/m3	0.19	1	04/02/15 08:51	04/02/15 13:16	179601-23-1	
o-Xylene	ND	ug/m3	0.096	1	04/02/15 08:51	04/02/15 13:16	95-47-6	
Surrogates								
Chlorobenzene-d5 (S)	123	%	70-130	1	04/02/15 08:51	04/02/15 13:16	3114-55-4	

HUF
16 Apr 15

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

QC Batch: AIR/22935

Analysis Method: TO-17M

QC Batch Method: TO-17M

Analysis Description: TO17 MSS AIR

Associated Lab Samples: 60191132001, 60191132002, 60191132003

METHOD BLANK: 1933021

Matrix: Air

Associated Lab Samples: 60191132001, 60191132002, 60191132003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	ND	0.24	04/02/15 10:59	
1,3,5-Trimethylbenzene	ug/m3	ND	0.24	04/02/15 10:59	
cis-1,2-Dichloroethene	ug/m3	ND	0.096	04/02/15 10:59	
Ethylbenzene	ug/m3	ND	0.096	04/02/15 10:59	
Isopropylbenzene (Cumene)	ug/m3	ND	0.24	04/02/15 10:59	
m&p-Xylene	ug/m3	ND	0.19	04/02/15 10:59	
Methyl-tert-butyl ether	ug/m3	ND	0.096	04/02/15 10:59	
o-Xylene	ug/m3	ND	0.096	04/02/15 10:59	
Tetrachloroethene	ug/m3	ND	0.24	04/02/15 10:59	
trans-1,2-Dichloroethene	ug/m3	ND	0.096	04/02/15 10:59	
Trichloroethene	ug/m3	ND	0.24	04/02/15 10:59	
Vinyl chloride	ug/m3	ND	0.096	04/02/15 10:59	
Chlorobenzene-d5 (S)	%.	116	70-130	04/02/15 10:59	

LABORATORY CONTROL SAMPLE: 1933022

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2,4-Trimethylbenzene	ug/m3	.15	.12J	75	72-137	
1,3,5-Trimethylbenzene	ug/m3	.15	.11J	74	73-134	
cis-1,2-Dichloroethene	ug/m3	.1	0.11	109	70-139	
Ethylbenzene	ug/m3	.12	.088J	76	63-140	
Isopropylbenzene (Cumene)	ug/m3	.13	.1J	78	75-135	
m&p-Xylene	ug/m3	.22	.17J	76	65-137	
Methyl-tert-butyl ether	ug/m3	.083	.073J	89	41-150	
o-Xylene	ug/m3	.12	.094J	78	64-139	
Tetrachloroethene	ug/m3	.18	.19J	104	64-141	
trans-1,2-Dichloroethene	ug/m3	.1	0.12	111	70-130	
Trichloroethene	ug/m3	.14	.13J	99	73-136	
Vinyl chloride	ug/m3	.067	.074J	110	59-150	
Chlorobenzene-d5 (S)	%.			118	70-130	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: WEST LAKE LANDFILL

Pace Project No.: 60191132

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

1e Surrogate standard was not added to this sample tube due to instrument error. The addition of a surrogate standard is not required per the TO17 method.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE


Project: WEST LAKE LANDFILL


Pace Project No.: 60191132

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60191132001	WAA-04-RV-PS-20150327	TO-17M	AIR/22935	TO-17M	AIR/22938
60191132002	WAA-04-RV-DU-20150327	TO-17M	AIR/22935	TO-17M	AIR/22938
60191132003	WAA-04-RV-TB-20150327	TO-17M	AIR/22935	TO-17M	AIR/22938

REPORT OF LABORATORY ANALYSIS

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	Document Name:	Document Revised: 26Dec2013
	Air Sample Condition Upon Receipt	Page 1 of 1
	Document No.: F-MN-A-106-rev.09	Issuing Authority: Pace Minnesota Quality Office

Air Sample Condition Upon Receipt	Client Name: <u>Fraser + Kuhn F&M</u>	Project #: WO# : 60191132
		

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client
☐ Commercial ☐ Pace ☐ Other: _____

Tracking Number: 773256165091

Custody Seal on Cooler/Box Present? ☒ Yes ☐ No Seals Intact? ☒ Yes ☐ No

Packing Material: ☐ Bubble Wrap ☒ Bubble Bags ☐ Foam ☐ None ☐ Other: _____ Temp Blank rec: ☐ Yes ☒ No

Temp. (TO17 and TO13 samples only) (°C): 5.1 Corrected Temp (°C): 5.3 Thermom. Used: ☐ B88A912167504 ☐ 72337080
☐ B88A9132521491 ☐ 80512447

Temp should be above freezing to 6°C Correction Factor: +0.2 Date & Initials of Person Examining Contents: 4/1/15 BD

Type of ice Received ☐ Blue ☒ Wet ☒ None

				Comments:
Chain of Custody Present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	1.
Chain of Custody Filled Out?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	2.
Chain of Custody Relinquished?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	3.
Sampler Name and/or Signature on COC?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A	7.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	8.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	9.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	
Containers Intact?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	10.
Media: <u>TCBS</u>				11.
Sample Labels Match COC?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A	12.

Canisters		Flow Controllers		Stand Alone G	
Sample Number	Can ID	Sample Number	Can ID	Sample Number	Can ID

CLIENT NOTIFICATION/RESOLUTION Field Data Required? ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: [Signature] Date: 4.3.15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)



CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:		Page: 1 of 1	
Company: Tetra Tech EMI		Report To: Emily Fisher		Attention: Emily Fisher			
Address: 415 Oak		Copy To:		Company Name: Tetra Tech		REGULATORY AGENCY	
Kansas City, MO 64106				Address: 415 Oak St, Kansas City, MO 64106		<input type="checkbox"/> NPDES <input type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER	
Email To: Emily.Fisher@tetratech.com		Purchase Order No.: 1111499		Pace Quote Reference:		<input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER	
Phone: (816) 412-1755 Fax:		Project Name: West Lake Landfill		Pace Project Manager: Sherri Rosenstangle		Site Location	
Requested Due Date/TAT:		Project Number:		Pace Profile #: 970.8		STATE: MO	

ITEM #	Section D Required Client Information	Valid Matrix Codes MATRIX CODE DRINKING WATER DW WT WATER WW WASTE WATER P PRODUCT SL SOIL/SOLID OL OIL WP WIPE AR AIR OT OTHER TS TISSUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED				TOTAL SAMPLING TIME (MINUTES)	AVERAGE SAMPLING TEMPERATURE (°C)	TUBE SERIAL NUMBER	Analysis Test TO-17 Passive	Requested Analysis Filtered (Y/N)										Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS		
	Timothy Barbeau/Tetra Tech	3/31/15	1100	Best Pace	4/1/15	10:10	5.3	Y	Y

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER: Timothy Barbeau					
SIGNATURE of SAMPLER: Timothy Barbeau					
DATE Signed (MM/DD/YY): 3/31/15					

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: ALS Environmental (Simi Valley, California)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 17, 2015

Sample Delivery Group (SDG): P1500832

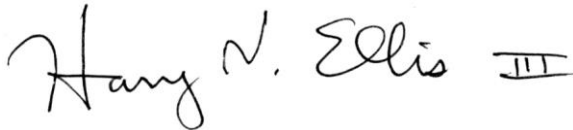
Sample Numbers: WAA-01-RH-PS-20150227, WAA-02-RH-PS-20150227, WAA-03-RH-PS-20150227, WAA-04-RH-PS-20150227, WAA-04-RH-DU-20150227, WAA-05-RH-PS-20150227, and WAA-00-RH-TB-20150227

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



17 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1500832 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

HYDROGEN SULFIDE ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

No analyte was detected.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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Simi Valley, CA 93065
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F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

March 25, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on March 4, 2015. For your reference, these analyses have been assigned our service request number P1500832.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental



By Sue Anderson at 2:08 pm, Mar 25, 2015

Sue Anderson
Project Manager



2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1500832

CASE NARRATIVE

The samples were received intact under chain of custody on March 4, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H₂S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	838341
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA01627201 4-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Project ID: West Lake Landfill / 103X9025140058

Service Request: P1500832

Date Received: 3/4/2015
Time Received: 11:25

CAS AQL 110 - H2S Air

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
WAA-01-RH-PS-20150227	P1500832-001	Air	2/27/2015	12:13	X
WAA-02-RH-PS-20150227	P1500832-002	Air	2/27/2015	11:24	X
WAA-03-RH-PS-20150227	P1500832-003	Air	2/27/2015	11:50	X
WAA-04-RH-PS-20150227	P1500832-004	Air	2/27/2015	12:03	X
WAA-05-RH-PS-20150227	P1500832-005	Air	2/27/2015	11:37	X
WAA-04-RH-DU-20150227	P1500832-006	Air	2/27/2015	12:03	X
WAA-00-RH-TB-20150227	P1500832-007	Air	2/27/2015	12:20	X

Radiello - Chain of Custody Record & Analytical Service Request

Page 1 of 1



2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Correct SR# is P1500832

Requested Turnaround Time in Business Days (Surcharges) please circle 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard	ALS Project No. P1500831
---	---------------------------------

Company Name & Address (Reporting Information) Tetra Tech 415 Oak Street, Kansas City, MO 64106		Project Name West Lake Landfill		ALS Contact: Sue Anderson	
Project Manager Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)		Project Number 103X9025140058		Analysis: (e.g. NO ₂ , SO ₂ , O ₃ , VOCs, Aldehyde, Ammonia)	
Phone 816-412-1775	Fax 816-410-1748	P.O. # / Credit Card / Billing Information PO 1111500		Comments	
Email Address for Result Reporting emily.fisher@tetrattech.com		Attn: Emily Fisher 415 Oak Street, Kansas City, MO 64106			
		emily.fisher@tetrattech.com			

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Hydrogen Sulfide			
WAA-01-RH-PS-20150227	①	2/20/15 @ 13:00	2/27/15 @ 12:13	10033	-5.0	200MH	X			
WAA-02-RH-PS-20150227	②	2/20/15 @ 12:07	2/27/15 @ 11:24	10037	-5.0	201MH	X			
WAA-03-RH-PS-20150227	③	2/20/15 @ 12:32	2/27/15 @ 11:50	10038	-5.0	202MH	X			
WAA-04-RH-PS-20150227	④	2/20/15 @ 12:50	2/27/15 @ 12:03	10033	-5.0	203MH	X			
WAA-05-RH-PS-20150227	⑤	2/20/15 @ 12:20	2/27/15 @ 11:37	10037	-5.0	204MH	X			
WAA-04-RH-DU-20150227	⑥	2/20/15 @ 12:50	2/27/15 @ 12:03	10033	-5.0	205MH	X			
WAA-00-RH-TB-20150227	⑦	2/20/15 @ 10:30	2/27/15 @ 12:20	NA	NA	206MH	X			

Report Tier Levels - please select one Tier I - (Results/Default: If not specified) _____ Tier II (Results + QC) _____ Tier III (Data Validation Package) 10% Surcharge _____ Tier V (client specified) _____ EDD required Yes _____ Type: _____								Chain of Custody Seal: (Circle) INTACT <u>INTACT</u> BROKEN ABSENT		Project Requirements (MRLs, QAPP) Cooler / Blank Temperature <u>20</u> °C
Relinquished by: (Signature) <u>Tina Baulson</u>		Date: <u>3/2/15</u> Time: <u>1400</u>		Received by: (Signature) <u>[Signature]</u>		Date: _____ Time: _____				
Relinquished by: (Signature) <u>[Signature]</u>		Date: _____ Time: _____		Received by: (Signature) <u>[Signature]</u>		Date: <u>3/4/15</u> Time: <u>1125</u>				
Relinquished by: (Signature) _____		Date: _____ Time: _____		Received by: (Signature) _____		Date: _____ Time: _____				

Lo 105

ALS Environmental Sample Acceptance Check Form

Client: Tetra Tech, Incorporated

Work order: P1500832

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 3/4/15

Date opened: 3/4/15

by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cooler Temperature: 20° C Blank Temperature: ° C			
9 Was a blank tube received?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were signature and date included?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were seals intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1500832-001.01	Passive (Radiello H2S)					
P1500832-002.01	Passive (Radiello H2S)					
P1500832-003.01	Passive (Radiello H2S)					
P1500832-004.01	Passive (Radiello H2S)					
P1500832-005.01	Passive (Radiello H2S)					
P1500832-006.01	Passive (Radiello H2S)					
P1500832-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1500832

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 2/27/15
Date Received: 3/4/15
Date Extracted: 3/13/15
Date Analyzed: 3/13/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling		Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
		Time Minutes	Dilution Factor							
WAA-01-RH-PS-20150227	P1500832-001	10033	1.0	ND	570	110	ND	1.2	0.24	
WAA-02-RH-PS-20150227	P1500832-002	10037	1.0	ND	570	110	ND	1.2	0.24	
WAA-03-RH-PS-20150227	P1500832-003	10038	1.0	ND	570	110	ND	1.2	0.24	
WAA-04-RH-PS-20150227	P1500832-004	10033	1.0	ND	570	110	ND	1.2	0.24	
WAA-05-RH-PS-20150227	P1500832-005	10037	1.0	ND	570	110	ND	1.2	0.24	
WAA-04-RH-DU-20150227	P1500832-006	10033	1.0	ND	570	110	ND	1.2	0.24	
WAA-00-RH-TB-20150227	P1500832-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150313-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

NA = Not applicable.

HVE
17 April 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1500832
ALS Sample ID: P150313-LCS,
P150313-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 3/13/15
Volume(s) Analyzed: NA

Compound	Spike Amount	Result		% Recovery		ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
	LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS				
Hydrogen Sulfide	500	482	477	96	95	73-129	1	5	

Service Request#: P1900832 P1900900

 Prep Run #: 231238

 Run #: 436277 page 1 of 2

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-07/51401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408/401	500425 ug/L	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric
Amino Sulfuric	524-0312/502	4/12/15	prepped prior to coloring step
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.998390487 DE=1.055			
Abs. @ 665 nm	0.000	0.061	0.124	0.246	0.636	0.954	1.172	DECORRECTED Temp. Corrected			
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
ICB	—	—	—	—	—	0.000	0.000	3.66 / 41.6			
ICV 500 ug/L	—	—	—	—	—	0.556	0.556	520			1040
MB1	—	25°C	0.010	—	—	0.012	0.012	3.66 / 41.6	410		
MB2	—	—	—	—	—	0.012	0.012	3.66 / 41.6	410		
LCS 500 ug/L	—	—	—	—	0.012	0.536	0.534	503.21 / 476.98	4824		960
DLS J	—	—	—	—	0.012	0.550	0.538	503.21 / 476.98	4770	MDL	950
P1500832-1.01	10034	23°C	—	—	0.012	0.025	0.013	4.61 / 41.6	410	20.89	21.24
-2.01	10048	—	—	—	0.012	0.023	0.011	2.71 / 41.6	410	20.89	21.24
-3.01	10040	—	—	—	0.012	0.022	0.010	1.76 / 41.6	410	20.89	21.24
-4.01	10037	—	—	—	0.012	0.027	0.015	6.51 / 41.6	410	20.89	21.24
-5.01	10043	—	—	—	0.012	0.024	0.012	3.66 / 41.6	410	20.89	21.24
-6.01	10037	—	—	—	0.012	0.025	0.013	4.61 / 41.6	410	20.89	21.24
CCV 500 ug/L	—	—	—	—	—	0.554	0.554	518			1040
CCV	—	—	—	—	—	0.000	0.000	7.74 / 41.6			

*Concentration after blank subtraction (as applicable)

 Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 mL of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

 Prepped By: [Signature]

 Analyzed By: [Signature]

 Reviewed By: [Signature]

 Date: 3/13/15 @ 1310

 Date: 3/13/15 @ 1340

 Date: 3/16/15

 TEMP CORRECTION = $\left(\frac{K}{298}\right)$

APPLY TO QK SAMPLING RATE



ALS Environmental

Hydrogen Sulfide (H₂S) in Air Bench Sheet

ALS AQL 110

Service Request#: P150832 P150900

Prep Run #: 231238

Run #: 436277 page 2 of 2

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-06151401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04081401	500425 ug/L	4/8/15

Cal 100%

8/23/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-06151402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric
Amino Sulfuric	524-03121502	4/12/15	prepped prior to coloring step
radiello Tube	14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run		NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff		
ug/L (ppb)		0	57.3	115	229	573	859	1145	0.99830487 DE		
Abs. @ 665 nm		0.000	0.001	0.124	0.246	0.636	0.954	1.172			
		Temp. Corrected									
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
P150832-7.01	0	—	0.010	—	0.012	0.014	0.002	5.84/411.6	2110	10.17	10.24
P150900-1.01	10034	-3.3°C	—	—	0.012	0.030	0.018	9.36/411.6	2110	10.87	11.21
—2.01	10048	—	—	—	0.012	0.031	0.019	10.37/411.6	2110	10.17	10.24
—3.01	10040	—	—	—	0.012	0.030	0.018	9.36/411.6	2110	—	—
—4.01	10037	—	—	—	0.012	0.030	0.018	9.36/411.6	2110	—	—
—5.01	10042	—	—	—	0.012	0.027	0.015	6.51/411.6	2110	—	—
—6.01	10037	—	—	—	0.012	0.033	0.021	12.205	11568	0.18	0.24
—7.01	0	—	—	—	0.012	0.014	0.002	5.84/411.6	2110	10.17	10.24
ICV2 500425	—	—	—	—	—	0.552	0.552	517	—	—	10300
CCV2	—	—	—	—	—	0.000	0.000	7.74/411.6	—	—	—

— ICV/CCV Acceptance Criteria: 90 -110%

— LCS/DLCS Acceptance Criteria: 73 – 129%

— RPD Acceptance Criteria: ≤ 5%

— Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

DE=1.055

10.24

ICV/CCV Acceptance Criteria: 90-110%

LCS/DLCS Acceptance Criteria: 73-129%

RPD Acceptance Criteria: ≤ 5%

Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: _____

Analyzed By: _____

Reviewed By: _____

Date: 3/13/15

Date: 3/13/15

Date: 3/16/15

TEMP. CORRECTION = $\left(\frac{K}{298}\right)^{3.8}$
APPLY TO Q16
SAMPLING RATE

3/18/14 524-03181401 500PM NO2
 Purchased
 Ricca Chemical Company Cat No 5444.5-4
 Lot # 2403762 120ml Amber glass
 Exp: 9/20/14

3/20/14 524-03201401 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI
 Exp: 11/20/14

4/8/14 524-04081401 Methylene Blue 2% Sol
 100ml, purchased 4/8/14 2425000 137L
 Alfa Aesar Lot K206010
 Stock # 42771
 Exp: 4/8/15

4/18/14 524-04081402 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI H2O
 Exp: 11/20/14

4/22/14 524-04221401 1000ppm SO3 Stock
 0.1591g Na2SO3 (JT Baker Lot # H10627; Exp: 8/31)
 ↑ 100ml w/ DI H2O.
 Exp: 5/6/14

6/25/14 S24-06251401 1:1 H₂SO₄
 250ml conc H₂SO₄ (EMD 49284; EXP: 11/20/14) +
 250 ml DI H₂O
 EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
 100g FeCl₃ · 6H₂O (Mallinckrodt J13631;
 EXPI: 9/25/15)
 EXP: 6/25/15

6/25/14 S24-06251403 Sulfanilamide Soln
 5.00g Sulfanilamide (JT Baker lot J32618; EXP 11/6/11)
 DISSOLVED IN 50ml conc HCl (EMP lot # 49200;
 EXP: 2/7/16) ↑ 500ml w/ DI H₂O
 EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
 SLOWLY ADD 6.25ml conc H₂SO₄ (EMD 49284;
 EXP: 11/20/14) TO 2.5ml DI. EtOH.
 DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
 diamine oxalat (ALDRICH MCR57841V; EXP:
 5/24/16) IN ABOVE ACID Soln then dilute
 to 250 ml w/ 1:1 H₂SO₄ (S24-06251401;
 EXP: 11/20/14).
 EXP: 0725/14

9/8/14 SZ4-09081401 0.1 N H₂SO₄
 5.6 ml conc. H₂SO₄ (EMD 49284; EXP: 11/20/14)
 ↑ 2L w/DI H₂O
 EXP: 11/20/14

9/8/14 SZ4-09081402 1.0 N NaOH
 8.0 g NaOH (EMD B0630569 12/13) ↑ 200 ml
 w/DI H₂O
 EXP: 9/8/15

9/15/14 SZ4-09151401 H₂S radiello stock
 Purchased Sigma Aldrich
 RAD 171 100 ml Amber GLASS
 LOT # 14279102 CAT # RAD 171
 Prepped 1:50 ⇒ 1.145 µg/ml Sulfide
 EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H₂S by the cartridge code RAD170.
 Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover, titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
 Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml⁻¹ sulfide ion.
 This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
 To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml ⁻¹ of S ²⁻
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
 Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

3/12/15
S24-03121502 AMINE SOLN

slowly ADD 6.25ml Conc H_2SO_4 (CMD 54174, EXP: 11/7/19)
to 2.5ml DI H_2O . let COOL.

Dissolve 1.6815g N,N-Dimethyl-1,4-phenylenediamine
oxalate (Aldrich MKBG 8041V EXP 5/24/16)

THEN DILUTE TO 250 ml w/ 1:1 H_2SO_4 (S24-0312
1501).

EXP: 4/12/15

S24-03181501

0.1N H_2SO_4

3/18/15
5.6ml Conc H_2SO_4 (CMD 54174; EXP: 11/7/19)

↑ 2L w/ DI H_2O

EXP: 3/18/15

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: ALS Environmental (Simi Valley, California)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 17, 2015

Sample Delivery Group (SDG): P1500900

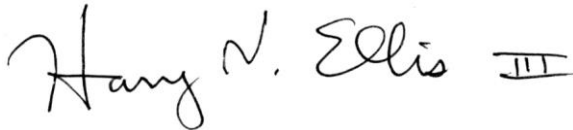
Sample Numbers: WAA-01-RH-PS-20150306, WAA-02-RH-PS-20150306,
WAA-03-RH-PS-20150306, WAA-04-RH-PS-20150306,
WAA-04-RH-DU-20150306, WAA-05-RH-PS-20150306, and
WAA-00-RH-TB-20150306

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



17 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1500900 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

HYDROGEN SULFIDE ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

The only detected result was above its sample detection limit but below its sample reporting limit, which corresponds to the lowest calibration standard. The laboratory correctly qualified this extrapolation as estimated and flagged it "J". No further qualifications were applied.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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LABORATORY REPORT

March 25, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on March 10, 2015. For your reference, these analyses have been assigned our service request number P1500900.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 2:16 pm, Mar 25, 2015

Sue Anderson
Project Manager



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www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1500900

CASE NARRATIVE

The samples were received intact under chain of custody on March 10, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H₂S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	876241
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA01627201 4-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Project ID: West Lake Landfill / 103X9025140058

Service Request: P1500900

Date Received: 3/10/2015
Time Received: 09:30

CAS AQL 110 - H2S Air

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
WAA-01-RH-PS-20150306	P1500900-001	Air	3/6/2015	11:27	X
WAA-02-RH-PS-20150306	P1500900-002	Air	3/6/2015	10:52	X
WAA-03-RH-PS-20150306	P1500900-003	Air	3/6/2015	11:10	X
WAA-04-RH-PS-20150306	P1500900-004	Air	3/6/2015	11:20	X
WAA-05-RH-PS-20150306	P1500900-005	Air	3/6/2015	10:59	X
WAA-04-RH-DU-20150306	P1500900-006	Air	3/6/2015	11:20	X
WAA-00-RH-TB-20150306	P1500900-007	Air	3/6/2015	11:35	X

Radiello - Chain of Custody Record & Analytical Service Request

Page 1 of 1



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Requested Turnaround Time in Business Days (Surcharges) please circle 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard	ALS Project No. P1500 900
---	----------------------------------

Company Name & Address (Reporting Information) Tetra Tech 415 Oak Street, Kansas City, MO 64106				Project Name West Lake Landfill			ALS Contact: Sue Anderson		
Project Manager Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)				Project Number 103X9025140058			Analysis: (e.g. NO ₂ , SO ₂ , O ₃ , VOCs, Aldehyde, Ammonia)		
Phone 816-412-1775		Fax 816-410-1748		P.O. # / Credit Card / Billing Information PO 1111500			Hydrogen Sulfide		Comments
Email Address for Result Reporting emily.fisher@tetratech.com				Attn: Emily Fisher 415 Oak Street, Kansas City, MO 64106					
				emily.fisher@tetratech.com					

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number			
WAA-01-RH-PS-20150306	①	2/27/15 @ 12:13	3/6/15 @ 11:27	10034	-3.3	207MH	X		
WAA-02-RH-PS-20150306	②	2/27/15 @ 11:24	3/6/15 @ 10:52	10048	-3.3	208MH	X		
WAA-03-RH-PS-20150306	③	2/27/15 @ 11:50	3/6/15 @ 11:10	10040	-3.3	209MH	X		
WAA-04-RH-PS-20150306	④	2/27/15 @ 12:03	3/6/15 @ 11:20	10037	-3.3	210MH	X		
WAA-05-RH-PS-20150306	⑤	2/27/15 @ 11:37	3/6/15 @ 10:59	10042	-3.3	211MH	X		
WAA-04-RH-DU-20150306	⑥	2/27/15 @ 12:03	3/6/15 @ 11:20	10037	-3.3	212MH	X		
WAA-00-RH-TB-20150306	⑦	2/27/15 @ 10:45	3/6/15 @ 11:35	NA	NA	213MH	X		

Report Tier Levels - please select one

Tier I - (Results/Default if not specified) _____		Tier III (Data Validation Package) 10% Surcharge _____		EDD required Yes		Chain of Custody Seal: (Circle)		Project Requirements (MRLs, QAPP)
Tier II (Results + QC) _____		Tier V (client specified) _____		Type: _____		<input checked="" type="radio"/> INTACT <input type="radio"/> BROKEN <input type="radio"/> ABSENT		
Relinquished by: (Signature) <i>Timothy Barlow</i>		Date: 3/9/15	Time: 1200	Received by: (Signature) <i>FEF</i>		Date:	Time:	
Relinquished by: (Signature) <i>FEF</i>		Date:	Time:	Received by: (Signature) <i>[Signature]</i>		Date: 3/10/15	Time: 0930	
Relinquished by: (Signature)		Date:	Time:	Received by: (Signature)		Date:	Time:	Cooler / Blank Temperature _____ °C

ALS Environmental Sample Acceptance Check Form

Client: Tetra Tech, Incorporated

Work order: P1500900

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 3/10/15

Date opened: 3/10/15

by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a trip blank received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were signature and date included?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were seals intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1500900-001.01	Passive (Radiello H2S)					
P1500900-002.01	Passive (Radiello H2S)					
P1500900-003.01	Passive (Radiello H2S)					
P1500900-004.01	Passive (Radiello H2S)					
P1500900-005.01	Passive (Radiello H2S)					
P1500900-006.01	Passive (Radiello H2S)					
P1500900-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1500900

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 3/6/15
Date Received: 3/10/15
Date Extracted: 3/13/15
Date Analyzed: 3/13/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling		Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
		Time Minutes	Dilution Factor							
WAA-01-RH-PS-20150306	P1500900-001	10034	1.0	ND	570	110	ND	1.2	0.23	
WAA-02-RH-PS-20150306	P1500900-002	10048	1.0	ND	570	110	ND	1.2	0.23	
WAA-03-RH-PS-20150306	P1500900-003	10040	1.0	ND	570	110	ND	1.2	0.23	
WAA-04-RH-PS-20150306	P1500900-004	10037	1.0	ND	570	110	ND	1.2	0.23	
WAA-05-RH-PS-20150306	P1500900-005	10042	1.0	ND	570	110	ND	1.2	0.23	
WAA-04-RH-DU-20150306	P1500900-006	10037	1.0	120	570	110	0.24	1.2	0.23	J
WAA-00-RH-TB-20150306	P1500900-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150313-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

NA = Not applicable.

HUG
 17 April 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1500900
ALS Sample ID: P150313-LCS,
P150313-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 3/13/15
Volume(s) Analyzed: NA

Compound	Spike Amount	Result		% Recovery		ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
	LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS				
Hydrogen Sulfide	500	482	477	96	95	73-129	1	5	

Service Request#: P1900832 P1900900

 Prep Run #: 231238

 Run #: 436277 page 1 of 2

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-07/51401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408/401	500425 ug/L	4/8/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric
Amino Sulfuric	524-03/2/502	4/12/15	prepped prior to coloring step
radiello Tube	143/15	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.998390487 DE=1.055			
Abs. @ 665 nm	0.000	0.061	0.124	0.246	0.636	0.954	1.172	DECORRECTED Temp. Corrected			
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
ICB	—	—	—	—	—	0.000	0.000	3.66 / 411.6			
ICV 500 ug/L	—	—	—	—	—	0.556	0.556	520			1040
MB1	—	25°C	0.010	—	—	0.012	0.012	3.66 / 411.6	4110		
MB2	—	—	—	—	—	0.012	0.012	3.66 / 411.6	4110		
LCS 500 ug/L	—	—	—	—	0.012	0.536	0.534	503.21 / 476.98	4824		960
DLS J	—	—	—	—	0.012	0.550	0.538	503.21 / 476.98	4770	MDL	950
P1500832-1.01	10034	23°C	—	—	0.012	0.025	0.013	4.61 / 411.6	4110	20.89	21.24
-2.01	10048	—	—	—	0.012	0.023	0.011	2.71 / 411.6	4110	20.89	21.24
-3.01	10040	—	—	—	0.012	0.022	0.010	1.76 / 411.6	4110	20.89	21.24
-4.01	10037	—	—	—	0.012	0.027	0.015	6.51 / 411.6	4110	20.89	21.24
-5.01	10043	—	—	—	0.012	0.024	0.012	3.66 / 411.6	4110	20.89	21.24
-6.01	10037	—	—	—	0.012	0.025	0.013	4.61 / 411.6	4110	20.89	21.24
CCV 500 ug/L	—	—	—	—	—	0.554	0.554	518			1040
CCV	—	—	—	—	—	0.000	0.000	7.74 / 411.6			

*Concentration after blank subtraction (as applicable)

 Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 mL of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

 Prepped By: [Signature]

 Analyzed By: [Signature]

 Reviewed By: [Signature]

 Date: 3/13/15 @ 1310

 Date: 3/13/15 @ 1340

 Date: 3/16/15

 TEMP CORRECTION = $\left(\frac{K}{298} \right)$

APPLY TO QK SAMPLING RATE



ALS Environmental

Hydrogen Sulfide (H₂S) in Air Bench Sheet

ALS AQL 110

Service Request#: P150832 P150900

Prep Run #: 231238

Run #: 436277 page 2 of 2

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-06151401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04081401	500425 ug/L	4/8/15

Cal 100%

8-23/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-06151402	6/25/15	10 mL Ferric Cl + 50
Amino Sulfuric	524-03121502	4/12/15	mL Amino Sulfuric
radiello Tube	14315	09/15	prepped prior to coloring step

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run		NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff		
ug/L (ppb)		0	57.3	115	229	573	859	1145	0.99830487 DE		
Abs. @ 665 nm		0.000	0.001	0.124	0.246	0.636	0.954	1.172			
		Temp. Corrected									
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
P150832-7.01	0	—	0.010	—	0.012	0.014	0.002	5.84/411.6	2110	10.17	10.24
P150900-1.01	10034	-3.3°C	—	—	0.012	0.030	0.018	9.36/411.6	2110	10.87	11.21
—2.01	10048	—	—	—	0.012	0.031	0.019	10.37/411.6	2110	10.17	10.24
—3.01	10040	—	—	—	0.012	0.030	0.018	9.36/411.6	2110	—	—
—4.01	10037	—	—	—	0.012	0.030	0.018	9.36/411.6	2110	—	—
—5.01	10042	—	—	—	0.012	0.027	0.015	6.51/411.6	2110	—	—
—6.01	10037	—	—	—	0.012	0.033	0.021	12.205	11568	0.18	0.24
—7.01	0	—	—	—	0.012	0.014	0.002	5.84/411.6	2110	10.17	10.24
ICV2 500425	—	—	—	—	—	0.552	0.552	517	—	—	10300
CCV2	—	—	—	—	—	0.000	0.000	7.74/411.6	—	—	—

— ICV/CCV Acceptance Criteria: 90 -110%

— LCS/DLCS Acceptance Criteria: 73 – 129%

— RPD Acceptance Criteria: ≤ 5%

— Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

DE=1.055

10.24

ICV/CCV Acceptance Criteria: 90-110%

LCS/DLCS Acceptance Criteria: 73-129%

RPD Acceptance Criteria: ≤ 5%

Note: the results as calculated on the Bench Sheet may vary slightly than what is reported due to sig figs used for calculation.

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: [Signature]

Analyzed By: [Signature]

Reviewed By: [Signature]

Date: 3/13/15 @ 1310

Date: 3/13/15 @ 1340

Date: 3/16/15

TEMP. CORRECTION = $\left(\frac{K}{298}\right)^{3.8}$
APPLY TO Q16
SAMPLING RATE

3/18/14 524-03181401 500PM NO2
 Purchased
 Ricca Chemical Company Cat No 5444.5-4
 Lot # 2403762 120ml Amber glass
 Exp: 9/20/14

3/20/14 524-03201401 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI
 Exp: 11/20/14

4/8/14 524-04081401 Methylene Blue 2% Sol
 100ml, purchased 4/8/14 2425000 137L
 Alfa Aesar Lot K206010
 Stock # 42771
 Exp: 4/8/15

4/8/14 524-04081402 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI H2O
 Exp: 11/20/14

4/22/14 524-04221401 1000ppm SO3 Stock
 0.1591g Na2SO3 (JT Baker Lot # H10627; Exp: 8/31)
 ↑ 100ml w/ DI H2O.
 Exp: 5/6/14

6/25/14 S24-06251401 1:1 H₂SO₄
 250ml conc H₂SO₄ (EMD 49284; EXP: 11/20/14) +
 250 ml DI H₂O
 EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
 100g FeCl₃ · 6H₂O (Mallinckrodt J13631;
 EXPI 9/25/15)
 EXP: 6/25/15

6/25/14 S24-06251403 Sulfanilamide Soln
 5.00g Sulfanilamide (JT Baker lot J32618; EXP 11/6/11)
 DISSOLVED IN 50ml conc HCl (EMP lot # 49200;
 EXP: 2/7/16) ↑ 500ml w/ DI H₂O
 EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
 SLOWLY ADD 6.25ml conc H₂SO₄ (EMD 49284;
 EXP: 11/20/14 TO 2.5ml DI. H₂O.
 DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
 diamine oxalat (ALDRICH MCR57841V; EXP:
 5/24/16) IN ABOVE ACID Soln then dilute
 to 250 ml w/ 1:1 H₂SO₄ (S24-06251401;
 EXP: 11/20/14).
 EXP: 0725/14

9/8/14 SZ4-09081401 0.1 N H₂SO₄
 5.6 ml conc. H₂SO₄ (EMD 49284; EXP: 11/20/14)
 ↑ 2L w/DI H₂O
 EXP: 11/20/14

9/8/14 SZ4-09081402 1.0 N NaOH
 8.0 g NaOH (EMD B0630569 12/13) ↑ 200 ml
 w/DI H₂O
 EXP: 9/8/15

9/15/14 SZ4-09151401 H₂S radiello stock
 Purchased Sigma Aldrich
 RAD 171 100 ml Amber GLASS
 LOT # 14279102 CAT # RAD 171
 Prepped 1:50 ⇒ 1.145 µg/ml Sulfide
 EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H₂S by the cartridge code RAD170.
 Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover, titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
 Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml⁻¹ sulfide ions.
 This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
 To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml ⁻¹ of S ²⁻
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
 Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

3/12/15
S24-03121502 AMINE SOLN

slowly ADD 6.25ml Conc H_2SO_4 (EMD 54174, EXP: 11/7/19)
to 2.5ml DI H_2O . let COOL.

Dissolve 1.6815g N,N-Dimethyl-1,4-phenylenediamine
oxalate (Aldrich MKBG 8041V EXP 5/24/16)

THEN DILUTE TO 250 ml w/ 1:1 H_2SO_4 (S24-0312
1501).

EXP: 4/12/15

S24-03181501

0.1N H_2SO_4

3/18/15
5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)

↑ 2L w/ DI H_2O

EXP: 3/18/15

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: ALS Environmental (Simi Valley, California)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 9, 2015

Sample Delivery Group (SDG): P1501117

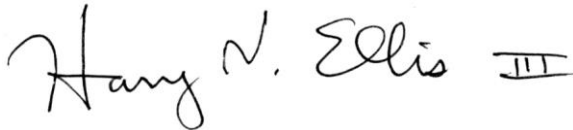
Sample Numbers: WAA-01-RH-PS-20150313, WAA-02-RH-PS-20150313, WAA-03-RH-PS-20150313, WAA-04-RH-PS-20150313, WAA-04-RH-DU-20150313, WAA-05-RH-PS-20150313, and WAA-00-RH-TB-20150313

Matrix / Number of Samples: 5 Air Samples, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



9 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P15001117 included five (5) environmental air (Radiello™ adsorbent tube) samples and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

HYDROGEN SULFIDE ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

All detected results in the field samples were less than the sample reporting limits, which correspond to the lowest calibration standard. The laboratory correctly qualified these results as estimated and flagged them "J". All detected results, including the field duplicate pair, were quite similar.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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F: +1 805 526 7270
www.alsglobal.com

LABORATORY REPORT

March 31, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on March 19, 2015. For your reference, these analyses have been assigned our service request number P1501117.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental



By Sue Anderson at 4:40 pm, Mar 31, 2015

Sue Anderson
Project Manager



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T: +1 805 526 7161
F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1501117

CASE NARRATIVE

The samples were received intact under chain of custody on March 19, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H₂S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	838341
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA01627201 4-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Project ID: West Lake Landfill / 103X9025140058

Service Request: P1501117

Date Received: 3/19/2015
Time Received: 09:40

CAS AQL 110 - H2S Air

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
WAA-01-RH-PS-20150313	P1501117-001	Air	3/13/2015	09:25	X
WAA-02-RH-PS-20150313	P1501117-002	Air	3/13/2015	09:32	X
WAA-03-RH-PS-20150313	P1501117-003	Air	3/13/2015	09:54	X
WAA-04-RH-PS-20150313	P1501117-004	Air	3/13/2015	10:06	X
WAA-05-RH-PS-20150313	P1501117-005	Air	3/13/2015	09:44	X
WAA-04-RH-DU-20150313	P1501117-006	Air	3/13/2015	10:06	X
WAA-00-RH-TB-20150313	P1501117-007	Air	3/13/2015	10:30	X

Radiello - Chain of Custody Record & Analytical Service Request

Page 1 of 1



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 Simi Valley, California 93065
 Phone (805) 526-7161
 Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle

1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

P1501117

Company Name & Address (Reporting Information)

Tetra Tech
 415 Oak Street,
 Kansas City, MO 64106

Project Name

West Lake Landfill

Project Number

103X9025140058

ALS Contact:

Sue Anderson

Analysis:

(e.g. NO₂, SO₂, O₃, VOCs, Aldehyde,
 Ammonia)

Project Manager

Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)

P.O. # / Credit Card / Billing Information

PO 1111500

Attn: Emily Fisher

415 Oak Street, Kansas City, MO 64106

Phone

816-412-1775

Fax

816-410-1748

Email Address for Result Reporting

emily.fisher@tetratech.com

emily.fisher@tetratech.com

Comments

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Hydrogen Sulfide			
WAA-01-RH-PS-20150313	1	3/6/15 @ 14:06	3/13/15 @ 09:25	9799	9.4	256MH	X			
WAA-02-RH-PS-20150313	2	3/6/15 @ 14:20	3/13/15 @ 09:32	9792	9.4	257MH	X			
WAA-03-RH-PS-20150313	3	3/6/15 @ 14:44	3/13/15 @ 09:54	9790	9.4	258MH	X			
WAA-04-RH-PS-20150313	4	3/6/15 @ 13:52	3/13/15 @ 10:06	9854	9.4	259MH	X			
WAA-05-RH-PS-20150313	5	3/6/15 @ 14:31	3/13/15 @ 09:44	9793	9.4	260MH	X			
WAA-04-RH-DU-20150313	6	3/6/15 @ 13:52	3/13/15 @ 10:06	9854	9.4	261MH	X			
WAA-00-RH-TB-20150313	7	3/6/15 @ 13:52	3/13/15 @ 10:30	NA	NA	262MH	X			

Report Tier Levels - please select one

Tier I - (Results/Default if not specified)

Tier III (Data Validation Package) 10% Surcharge

EDD required Yes

Chain of Custody Seal: (Circle)

Project Requirements (MRLs, QAPP)

Tier II (Results + QC)

Tier V (client specified)

Type:

INTACT BROKEN ABSENT

Relinquished by: (Signature)

Tina Boulton

Date:

3/17/15

Time:

1200

Received by: (Signature)

FED EX

Date:

3/19/15

Time:

0940

Relinquished by: (Signature)

Fisher

Date:

Time:

Received by: (Signature)

VLS

Date:

Time:

Relinquished by: (Signature)

Date:

Time:

Received by: (Signature)

Date:

Time:

Cooler / Blank Temperature °C

NO

ALS Environmental
Sample Acceptance Check Form

Client: Tetra Tech, Incorporated

Work order: P1501117

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 3/19/15

Date opened: 3/19/15

by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a blank tube received?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were signature and date included?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were seals intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1501117-001.01	Passive (Radiello H2S)					
P1501117-002.01	Passive (Radiello H2S)					
P1501117-003.01	Passive (Radiello H2S)					
P1501117-004.01	Passive (Radiello H2S)					
P1501117-005.01	Passive (Radiello H2S)					
P1501117-006.01	Passive (Radiello H2S)					
P1501117-007.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

Samples were not refrigerated

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: **Tetra Tech, Incorporated**
 Client Project ID: **West Lake Landfill / 103X9025140058**

ALS Project ID: **P1501117**

Hydrogen Sulfide

Test Code: **ALS AQL 110**
 Instrument ID: **P-UV-Vis-01**
 Analyst: **Sue Anderson**
 Sampling Media: **Radiello Tube(s)**
 Test Notes:

Date(s) Collected: **3/13/15**
 Date Received: **3/19/15**
 Date Extracted: **3/20/15**
 Date Analyzed: **3/20/15**
 Desorption Volume: **0.010 Liter(s)**

Client Sample ID	ALS Sample ID	Sampling		Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
		Time Minutes	Dilution Factor							
WAA-01-RH-PS-20150313	P1501117-001	9799	1.0	130	570	110	0.24	1.0	0.20	J
WAA-02-RH-PS-20150313	P1501117-002	9792	1.0	260	570	110	0.48	1.0	0.20	J
WAA-03-RH-PS-20150313	P1501117-003	9790	1.0	ND	570	110	ND	1.0	0.20	
WAA-04-RH-PS-20150313	P1501117-004	9854	1.0	240	570	110	0.43	1.0	0.20	J
WAA-05-RH-PS-20150313	P1501117-005	9793	1.0	170	570	110	0.31	1.0	0.20	J
WAA-04-RH-DU-20150313	P1501117-006	9854	1.0	210	570	110	0.38	1.0	0.20	J
WAA-00-RH-TB-20150313	P1501117-007	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150320-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

NA = Not applicable.

HUG 9 April 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1501117
ALS Sample ID: P150320-LCS,
P150320-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 3/20/15
Volume(s) Analyzed: NA

Compound	Spike Amount	Result		% Recovery		ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
	LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS				
Hydrogen Sulfide	500	503	505	101	101	73-129	0	5	

Service Request#: P1501105 P1501117 P1501012

Prep Run #: 231954

Run #: 4375/2

page 1062

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-0915/401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0405/401	506425 ug/L	4/8/15

@ 900X 3/20/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/402	6/25/15	10 mL Ferric Cl + 50 mL Amino Sulfuric
Amino Sulfuric	524-0312/502	4/12/15	prepped prior to coloring step
radiello Tube	QC 14315 P1501105 1012 1415 P1501117 14315	09/15	

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145				
Abs. @ 665 nm	0.000	0.057	0.122	0.243	0.582	0.870	1.158	0.9999549474			
								Temp. Corrected			
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb) ^m	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
ICB2	—	—	—	—	—	0.000	6.000	-3.80 111.6			
ICV2 900 ^{ug} /L	—	—	—	—	—	0.554	0.554	545			109%
MDI-2	—	25°C	0.010	—	—	0.014	0.014	10.1 111.6	1110		
MDI-2	—	—	—	—	—	0.014	0.014	10.1 111.6	1110		
LCS2 500 ^{ug} /L	—	—	—	—	0.014	0.553	0.539	530.38 502.73	5027	110%	101%
DLCS2 I	—	—	—	—	0.014	0.555	0.541	532.36 504.61	5046	107%	101%
P1501105-4.01	1535	—	—	—	0.014	0.020	0.006	2.15 111.6	1110	10.75	11.05
I-5.01	1460	—	—	—	0.014	0.033	0.019	15.032	142.48	1.02	1.42
I-6.01	1447	—	—	—	0.014	0.025	0.011	7.10 111.6	1110	10.80	11.11
P1501117-1.01	9799	9.4°C	—	—	0.014	0.032	0.018	14.041	133.090	0.174	0.24
I-2.01	9792	—	—	—	0.014	0.046	0.032	27.915	264.597	0.345	0.48
I-3.01	9790	—	—	—	0.014	0.028	0.014	10.1 111.6	1110	10.015	10.022
CCV1-2 500 ^{ug} /L	—	—	—	—	—	0.552	0.552	542.543			109%
CCV1-2	—	—	—	—	—	0.000	0.000	-3.80 111.6			

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: [Signature]

Analyzed By: [Signature]

Reviewed By: [Signature]

Date: 3/20/15

Date: 3/20/15

Date: 3/24/15

TEMP CORRECTION $\left(\frac{K}{298}\right)$

APPLY TO OK SAMPLING RATE

Service Request#: P1501105 P1501117 P1501012

Prep Run #: 23/954

Run #: 437512

Page 2002

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-0415401	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-0408140	500425 ug/L	4/8/15

@9000x 3/20/15

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625402	6/25/15	10 mL Ferric Cl + 50
Amino Sulfuric	524-0321502	4/12/15	mL Amino Sulfuric
radiello Tube	RL: P1501117 14315 P1501105, 1012 14151	6/1/2015 25/2015	prepped prior to coloring step

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.9999549474			
Abs. @ 665 nm	0.000	0.057	0.122	0.243	0.982	0.890	1.158	DELOPATED RE-1055			
Temp. Corrected											
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
P1501117-4.01	9854	9.4°C	0.010	—	0.014	0.043	0.029	24.942	236.417	0.307	0.427
5.01	9793	—	—	—	0.014	0.036	0.022	18.005	179.154	0.234	0.326
6.01	9854	—	—	—	0.014	0.040	0.026	21.969	208.286	0.270	0.376
7.01	—	—	—	—	0.014	0.014	0.000	-3.80 411.6	411.6	—	—
P1501012-017.01	1440	25°C	—	—	0.014	0.014	0.000	-3.80 411.6	—	40.80	4.11
-018.01	1453	—	—	—	0.014	0.015	0.001	-2.81 411.6	—	40.79	4.10
-019.01	1440	—	—	—	0.014	0.014	0.000	-3.80 411.6	—	40.80	4.11
-020.01	1440	—	—	—	0.014	0.014	0.000	-3.80 411.6	—	—	—
-021.01	1440	—	—	—	0.014	0.015	0.001	-2.81 411.6	—	—	—
-022.01	—	—	—	—	0.014	0.014	0.000	-3.80 411.6	—	—	—
CCV2-2 500916	—	—	—	—	—	0.552	0.550	543	—	—	1090
CCV2-2	—	—	—	—	—	0.000	0.000	-3.80 411.6	—	—	—

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: [Signature]

Analyzed By: [Signature]

Reviewed By: [Signature]

DATE: 3/20/15 @ 1425
DATE: 3/20/15 @ 1455
DATE: 3/24/15

TEMP CORRECTION = $\left(\frac{E}{298} \right)^{3.8}$
APPLY TO ALL SAMPLING RARZ

3/18/14 524-03181401 500PM NO2
 Purchased
 Ricca Chemical Company Cat No 5444.5-4
 Lot # 2403762 120ml Amber glass
 Exp: 9/20/14

3/20/14 524-03201401 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI
 Exp: 11/20/14

4/8/14 524-04081401 Methylene Blue 2% Sol
 100ml, purchased
 Alfa Aesar Lot K206010
 Stock # 42771
 Exp: 4/8/15

4/8/14 524-04081402 0.1 N H2SO4
 5.6 ml conc H2SO4 (EMD 49284; Exp:
 11/20/14) ↑ 2L w/ DI H2O
 Exp: 11/20/14

4/22/14 524-04221401 1000ppm SO3 Stock
 0.1591g Na2SO3 (JT Baker Lot # H10627; Exp: 8/31)
 ↑ 100ml w/ DI H2O
 Exp: 5/6/14

6/25/14 S24-06251401 1:1 H₂SO₄
 250ml conc H₂SO₄ (EMD 49284; EXP: 11/20/14) +
 250 ml DI H₂O
 EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
 100g FeCl₃ · 6H₂O (Mallinckrodt J13631;
 EXPI: 9/25/15)
 EXP: 6/25/15

6/25/14 S24-06251403 Sulfanilamide Soln
 5.00g Sulfanilamide (JT Baker lot J32618; EXP 11/6/11)
 DISSOLVED IN 50ml conc HCl (EMP lot # 49200;
 EXP: 2/7/16) ↑ 500ml w/ DI H₂O
 EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
 SLOWLY ADD 6.25ml conc H₂SO₄ (EMD 49284;
 EXP: 11/20/14) TO 2.5ml DI. EtOH.
 DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
 diamine oxalat (ALDRICH MCR57841V; EXP:
 5/24/16) IN ABOVE ACID Soln then dilute
 to 250 ml w/ 1:1 H₂SO₄ (S24-06251401;
 EXP: 11/20/14).
 EXP: 0725/14

9/8/14 SZ4-09081401 0.1 N H₂SO₄
 5.6 ml conc. H₂SO₄ (EMD 49284; EXP: 11/20/14)
 ↑ 2L w/DI H₂O
 EXP: 11/20/14

9/8/14 SZ4-09081402 1.0 N NaOH
 8.0 g NaOH (EMD B0630569 12/13) ↑ 200 ml
 w/DI H₂O
 EXP: 9/8/15

9/15/14 SZ4-09151401 H₂S radiello stock
 Purchased Sigma Aldrich
 RAD 171 100 ml Amber GLASS
 LOT # 14279102 CAT # RAD 171
 Prepped 1:50 ⇒ 1.145 µg/ml Sulfide
 EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H₂S by the cartridge code RAD170.
 Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover, titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
 Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg/ml-1 sulfide ions.
 This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
 To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg ml ⁻¹ of S ²⁻
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
 Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

3/12/15
S24-03121502 AMINE SOLN

slowly ADD 6.25ml Conc H_2SO_4 (EMD 54174, EXP: 11/7/19)
to 2.5ml DI H_2O . let COOL.

Dissolve 1.6815g N,N-Dimethyl-1,4-phenylenediamine
oxalate (Aldrich MKBG 8041V EXP 5/24/16)

THEN DILUTE TO 250 ml w/ 1:1 H_2SO_4 (S24-0312
1501).

EXP: 4/12/15

S24-03181501

0.1N H_2SO_4

3/18/15
5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)

↑ 2L w/ DI H_2O

EXP: 3/18/15

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: ALS Environmental (Simi Valley, California)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 17, 2015

Sample Delivery Group (SDG): P1501192

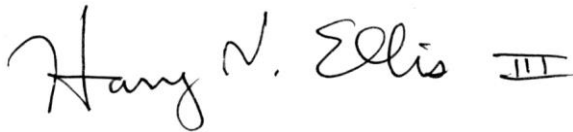
Sample Numbers: WAA-04-RH-PS-20150320, WAA-04-RH-DU-20150320, and
WAA-00-RH-TB-20150320

Matrix / Number of Samples: 1 Air Sample, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



17 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1501192 included one (1) environmental air (Radiello™ adsorbent tube) sample and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

HYDROGEN SULFIDE ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

The identical detected results in the sample and its field duplicate were above their sample detection limits but below their sample reporting limits, which correspond to the lowest calibration standard. The laboratory correctly qualified these extrapolations as estimated and flagged them "J". No further qualifications were applied.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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www.alsglobal.com

LABORATORY REPORT

April 9, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on March 25, 2015. For your reference, these analyses have been assigned our service request number P1501192.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 4:07 pm, Apr 09, 2015

Sue Anderson
Project Manager



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F: +1 805 526 7270
www.alsglobal.com

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1501192

CASE NARRATIVE

The samples were received intact under chain of custody on March 25, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (HR₂S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	876241
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA01627201 4-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Project ID: West Lake Landfill / 103X9025140058

Service Request: P1501192

Date Received: 3/25/2015
Time Received: 10:00

CAS AQL 110 - H2S Air

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
WAA-04-RH-PS-20150320	P1501192-001	Air	3/20/2015	10:08	X
WAA-04-RH-DU-20150320	P1501192-002	Air	3/20/2015	10:08	X
WAA-00-RH-TB-20150320	P1501192-003	Air	3/20/2015	10:38	X

Radiello - Chain of Custody Record & Analytical Service Request

Page 1 of 1



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Simi Valley, California 93065
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Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard	ALS Project No. P1501192
---	---------------------------------

Company Name & Address (Reporting Information) Tetra Tech 415 Oak Street, Kansas City, MO 64106		Project Name West Lake Landfill		ALS Contact: Sue Anderson	
Project Manager Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)		Project Number 103X9025140058		Analysis: (e.g. NO ₂ , SO ₂ , O ₃ , VOCs, Aldehyde, Ammonia)	
Phone 816-412-1775		P.O. # / Credit Card / Billing Information PO 1111500		Comments	
Fax 816-410-1748		Attn: Emily Fisher			
Email Address for Result Reporting emily.fisher@tetrattech.com		415 Oak Street, Kansas City, MO 64106			
		emily.fisher@tetrattech.com			

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number	Hydrogen Sulfide		
0		3/13/15 @ 00:00	3/20/15 @ 00:00	0	0.0	0	X		
0		1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
0		1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
WAA-04-RH-PS-20150320		3/13/15 @ 10:14	3/20/15 @ 10:08	10074	11.1	267MH	X		
0		1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
WAA-04-RH-DU-20150320		3/13/15 @ 10:14	3/20/15 @ 10:08	10074	11.1	268MH	X		
WAA-00-RH-TB-20150320		3/13/15 @ 10:30	3/20/15 @ 10:38	NA	NA	264MH	X		

Report Tier Levels - please select one						Project Requirements (MRLs, QAPP)	
Tier I - (Results/Default if not specified) _____		Tier III (Data Validation Package) 10% Surcharge _____		EDD required Yes _____		Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT	
Tier II (Results + QC) _____		Tier V (client specified) _____		Type: _____			
Relinquished by: (Signature) <i>Tuffy Barboon</i>	Date: 3/24/15	Time: 1100		Received by: (Signature) <i>Fisher</i>	Date: 3/25/15	Time: 1000	Cooler / Blank Temperature _____ °C
Relinquished by: (Signature) <i>Pen</i>	Date:	Time:		Received by: (Signature) <i>VK</i>	Date:	Time:	
Relinquished by: (Signature)	Date:	Time:		Received by: (Signature)	Date:	Time:	

no gel packs

ALS Environmental Sample Acceptance Check Form

Client: Tetra Tech, Incorporated

Work order: P1501192

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 3/25/15

Date opened: 3/25/15

by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a blank tube received?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Were custody seals on outside of cooler/Box?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were signature and date included?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were seals intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 Tubes: Are the tubes capped and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1501192-001.01	Passive (Radiello H2S)					
P1501192-002.01	Passive (Radiello H2S)					
P1501192-003.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1501192

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 3/20/15
Date Received: 3/25/15
Date Extracted: 4/8/15
Date Analyzed: 4/8/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling		Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
		Time Minutes	Dilution Factor							
WAA-04-RH-PS-20150320	P1501192-001	10074	1.0	150	570	110	0.25	0.98	0.19	J
WAA-04-RH-DU-20150320	P1501192-002	10074	1.0	150	570	110	0.25	0.98	0.19	J
WAA-00-RH-TB-20150320	P1501192-003	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150408-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

NA = Not applicable.

HVE
 17 April 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1501192
ALS Sample ID: P150408-LCS,
P150408-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 4/08/15
Volume(s) Analyzed: NA

Compound	Spike Amount	Result		% Recovery		ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
	LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS				
Hydrogen Sulfide	500	502	499	100	100	73-129	0	5	



2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Hydrogen Sulfide (H₂S) in Air Bench Sheet

ALS: AQL 110

P1501192
P1501359

Prep Run #: 233255

Run #: 439775

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-09/15/14	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04/01/15 01	500.425 ug/L	4/1/14

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/14 02	6/25/15	10 mL Ferric Cl + 50
Amino Sulfuric	524-03/12/15 02	4/12/15	mL Amino Sulfuric
radiello Tube	14315	09/15	prepped prior to coloring step

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.99935305			
Abs. @ 665 nm	0.000	0.058	0.124	0.246	0.585	0.872	1.169				
Temp. Corrected											
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
ICV	—	—	—	—	—	0.000	0.000	-4.15/411.6			
ICV 500 ug/L	—	—	—	—	—	0.550	0.550	537			1070
MB1	—	25°C	0.010	—	—	0.005	0.005	0.77/411.6	L110		
MB2	—	—	—	—	—	0.005	0.005	0.77/411.6	L110		
LCS 500 ug/L	—	—	—	—	0.005	0.547	0.542	524.57 501.96	5020		1000
DLCS J	—	—	—	—	0.005	0.544	0.539	526.62 499.16	4992		1000
P1501192-1.0/	10074	11.10°C	—	—	0.005	0.025	0.020	15.543	147.323	0.18	0.25
J -2.0/	10074	J	—	—	0.005	0.025	0.020	15.543	147.323	0.18	0.25
J -3.0/	0	NA	—	—	0.005	0.006	0.001	-3.17/411.6	L110		
P1501359-1.0/	10046	9.40°C	—	—	0.005	0.022	0.017	12.588	119.321	0.15	0.21
J -2.0/	10046	9.40°C	—	—	0.005	0.022	0.017	12.588	119.321	0.15	0.21
J -3.0/	0	NA	—	—	0.005	0.006	0.001	-3.17/411.6	L110		
CCV 500 ug/L	—	—	—	—	—	0.550	0.550	537			1070
CCV1	—	—	—	—	—	0.000	0.000	-4.15/411.6			

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: SKK

Analyzed By: SKK

Reviewed By: [Signature]

Date: 4/8/15 @ 1130

Date: 4/8/15 @ 1300

Date: 4/9/15

TEMP CORRECTION = (K/218)

Apply to R_x SAMPLING DATE

ICV/CCV Acceptance Criteria: 90 - 110%
LCS/DLCS Acceptance Criteria: 73 - 129%
RPD Acceptance Criteria: ≤5%

slightly than what is reported due to sig figs used for calculation.

6/25/14 S24-06251401 1:1 H₂SO₄
 250ml conc H₂SO₄ (EMD 49284; EXP: 11/20/14) +
 250 ml DI H₂O
 EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
 100g FeCl₃ · 6H₂O (Mallinckrodt J13631;
 EXPI: 9/25/15)
 EXP: 6/25/15

6/25/14 S24-06251403 Sulfanilamide Soln
 5.00g Sulfanilamide (JT Baker lot J32618; EXP 11/6/11)
 DISSOLVED IN 50ml conc HCl (EMP lot # 49200;
 EXP: 2/7/16) ↑ 500ml w/ DI H₂O
 EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
 SLOWLY ADD 6.25ml conc H₂SO₄ (EMD 49284;
 EXP: 11/20/14 TO 2.5ml DI. H₂O.
 DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
 diamine oxalat (ALDRICH MCR57841V; EXP:
 5/24/16) IN ABOVE ACID Soln then dilute
 to 250 ml w/ 1:1 H₂SO₄ (S24-06251401;
 EXP: 11/20/14).
 EXP: 0725/14

9/8/14 SZ4-09081401 0.1 N H₂SO₄
 5.6 ml conc. H₂SO₄ (EMD 49284; EXP: 11/20/14)
 ↑ 2L w/DI H₂O
 EXP: 11/20/14

9/8/14 SZ4-09081402 1.0 N NaOH
 8.0 g NaOH (EMD B0630569 12/13) ↑ 200 ml
 w/DI H₂O
 EXP: 9/8/15

9/15/14 SZ4-09151401 H₂S radiello stock
 Purchased Sigma Aldrich
 RAD 171 100 ml Amber GLASS
 LOT # 14279102 CAT # RAD 171
 Prepped 1:50 ⇒ 1.145 µg/ml Sulfide
 EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H₂S by the cartridge code RAD170.
 Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover, solution must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%).
 Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml⁻¹ sulfide ion.
 This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer.
 To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml ⁻¹ of S ²⁻
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers.
 Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

3/12/15 S24-03121502 AMINE SOLN
 slowly ADD 6.25ml Conc H_2SO_4 (EMD 54174, EXP: 11/7/19)
 to 2.5ml DI H_2O . let cool.
 Dissolve 1.6815g N,N-Dimethyl-1,4-phenylenediamine
 oxalate (Aldrich MKBG 8041V EXP 5/24/16)
 then DILUTE to 250 ml w/ 1:1 H_2SO_4 (S24-0312
 1501).

EXP: 4/12/15

3/18/15 S24-03181501
 0.1N H_2SO_4
 5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
 ↑ 2 L w/ DI H_2O
 EXP: 3/18/16

3/26/15 S24-03261501 500ppm NO₂
 Purchased
 RICA Chem Company Cat No 54445-4
 Lot # 1503052
 EXP 9/15/15

3/26/15 S24-03261502 0.1N H_2SO_4
 5.6 ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
 ↑ 2 L w/ DI H_2O
 EXP: 3/26/15

3/26/15 524-03261503 1000 NH₃ Stock
 In 0.3741g NH₄Cl (END WJ11C; EXP: 6/5/19) ↑
 100 ml w/ 524-03261502).
 EXP: 9/26/15

4/1/15 524-04011501 Methylene Blue 1% Soln
 100ml plastic purchase
 Alfa Aesar Lot # F86A024
 EXP: 4/1/16

4/1/15 524-04011502 0.1 N H₂SO₄
 5.6ml Conc H₂SO₄ (END 54174; EXP: 11/7/17)
 ↑ 2 L w/ DI H₂O
 EXP: 3/5/16 4/1/16
 4/1/15

Tetra Tech, Inc.
DATA VALIDATION REPORT
LEVEL II

Site: West Lake Landfill Site, Bridgeton, Missouri

Laboratory: ALS Environmental (Simi Valley, California)

Data Reviewer: Harry Ellis, Tetra Tech, Inc. (Tetra Tech)

Review Date: April 20, 2015

Sample Delivery Group (SDG): P1501359

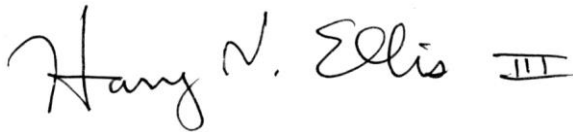
Sample Numbers: WAA-04-RH-PS-20150327, WAA-04-RH-DU-20150327, and
WAA-00-RH-TB-20150327

Matrix / Number of Samples: 1 Air Sample, 1 Field Duplicate Sample, and 1 Trip Blank

The data were qualified according to the U.S. Environmental Protection Agency (EPA) Region 7 documents entitled "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review" (9240.1-48), June 2008. In addition, the Tetra Tech document "Review of Data Packages from Subcontracted Laboratories" (February 2002) was used along with other criteria specified in the applicable methods.

The review was intended to identify problems and quality control (QC) deficiencies that were readily apparent from the summary data package. The following sections discuss any problems or deficiencies that were found, and data qualifications applied because of non-compliant QC. The data review was limited to the available field and laboratory QC information submitted with the project-specific data package.

I, Harry Ellis, certify that all data validation criteria outlined in the above-referenced documents were assessed, and any qualifications made to the data accorded with those documents.



20 April 2015

Certified by Harry Ellis, Chemist

Date

DATA VALIDATION QUALIFIERS

- U** — The analyte was not detected above the reported sample quantitation limit.
- J** — The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ** — The analyte was not detected above the reported sample quantitation limit, which is estimated.
- R** — The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. Presence or absence of the analyte cannot be verified.

DATA ASSESSMENT

Sample delivery group (SDG) P1501359 included one (1) environmental air (Radiello™ adsorbent tube) sample and two (2) QC samples (a field duplicate and a trip blank). Samples were analyzed for hydrogen sulfide via the laboratory's implementation of the manufacturer's method. The following summarizes the data validation that was performed.

HYDROGEN SULFIDE ANALYSIS

I. Holding Time and Chain of Custody (COC) Requirements

The samples were received by the laboratory and analyzed within the accepted holding time of 30 days from sample collection by tube to analysis. No data were qualified.

II. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses are not practical for air analyses. Satisfactory LCS and field duplicate sample analysis provided adequate data on precision and accuracy. No qualifications were applied.

III. Blanks

No analytes were detected in the laboratory (method) and field blanks. No qualifications were applied.

IV. Laboratory Control Sample (LCS)

All results for the duplicate LCS were within QC limits.

V. Surrogates

Surrogates are not used in this analysis.

VI. Comments

The identical detected results in the sample and its field duplicate were above their sample detection limits but below their sample reporting limits, which correspond to the lowest calibration standard. The laboratory correctly qualified these extrapolations as estimated and flagged them "J". No further qualifications were applied.

VII. Overall Assessment of Data

Overall data quality is acceptable, with no qualifications added. All data are usable as reported for their intended purposes.

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LABORATORY REPORT

April 17, 2015

Rob Monnig
Tetra Tech, Incorporated
415 Oak Street
Kansas City, MO 64106

RE: West Lake Landfill / 103X9025140058

Dear Rob:

Enclosed are the results of the samples submitted to our laboratory on April 3, 2015. For your reference, these analyses have been assigned our service request number P1501359.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental



By Sue Anderson at 10:06 am, Apr 17, 2015

Sue Anderson
Project Manager

Client: Tetra Tech, Incorporated
Project: West Lake Landfill / 103X9025140058

Service Request No: P1501359

CASE NARRATIVE

The samples were received intact under chain of custody on April 3, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Hydrogen Sulfide in Air (H₂S) Analysis

The samples were prepared in accordance with CAS AQL 110 for hydrogen sulfide in air and analyzed by colorimetric method using a spectrophotometer. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
AIHA	http://www.aihaaccreditedlabs.org	101661
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0694
DoD ELAP	http://www.pjlabs.com/search-accredited-labs	L14-2
Florida DOH (NELAP)	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E871020
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm	2014025
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	876241
New Jersey DEP (NELAP)	http://www.nj.gov/dep/oqa/	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-001
Pennsylvania DEP	http://www.depweb.state.pa.us/labs	68-03307 (Registration)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704413-14-5
Utah DOH (NELAP)	http://www.health.utah.gov/lab/labimp/certification/index.html	CA01627201 4-4
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Tetra Tech, Incorporated
Project ID: West Lake Landfill / 103X9025140058

Service Request: P1501359

Date Received: 4/3/2015
Time Received: 10:05

CAS AQL 110 - H2S Air

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
WAA-04-RH-PS-20150327	P1501359-001	Air	3/27/2015	09:36	X
WAA-04-RH-DU-20150327	P1501359-002	Air	3/27/2015	09:36	X
WAA-00-RH-TB-20150327	P1501359-003	Air	3/27/2015	09:55	X

Radiello - Chain of Custody Record & Analytical Service Request

Page 1 of 1



2655 Park Center Drive, Suite A
 Simi Valley, California 93065
 Phone (805) 526-7161
 Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard	ALS Project No. P1501359
---	---------------------------------

Company Name & Address (Reporting Information)

Tetra Tech
415 Oak Street,
Kansas City, MO 64106

Project Manager

Rob Monnig (816-412-1775) / Dave Kinroth (314-517-6798)

Phone

816-412-1775

Fax

816-410-1748

Email Address for Result Reporting

emily.fisher@tetratech.com

Project Name

West Lake Landfill

Project Number

103X9025140058

P.O. # / Credit Card / Billing Information

PO 1111500

Attn: Emily Fisher

415 Oak Street, Kansas City, MO 64106

emily.fisher@tetratech.com

ALS Contact:

Sue Anderson

Analysis:

(e.g. NO₂, SO₂, O₃, VOCs, Aldehyde, Ammonia)

Hydrogen Sulfide

Comments

Client Sample ID	Laboratory ID Number	Date/Time Start	Date/Time End	Total Sampling Time (minutes)	Sampling Temp 25°C assumed if not specified	Radiello ID Sticker Number			
	0	3/20/15 @ 00:00	3/27/15 @ 00:00	0	0.0	0	X		
	0	1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
	0	1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
WAA-04-RH-PS-20150327	①	3/20/15 @ 10:10	3/27/15 @ 09:36	10046	9.4	172CY	X		
	0	1/0/00 @ 00:00	1/0/00 @ 00:00	0	0.0	0	X		
WAA-04-RH-DU-20150327	②	3/20/15 @ 10:10	3/27/15 @ 09:36	10046	9.4	173CY	X		
WAA-00-RH-TB-20150327	③	3/20/15 @ 09:20	3/27/15 @ 09:55	NA	NA	174CY	X		

Report Tier Levels - please select one

Tier I - (Results/Default if not specified) _____ Tier III (Data Validation Package) 10% Surcharge _____

Tier II (Results + QC) _____ Tier V (client specified) _____

EDD required: **Yes**
 Type: _____

Chain of Custody Seal: (Circle)
 INTACT ☒ BROKEN ☐ ABSENT ☐

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) <i>Tony Bonbeon</i>	Date: 3/31/15	Time: 1040	Received by: (Signature) <i>For op</i>	Date: 4/1/15	Time: 1005
Relinquished by: (Signature) <i>For op</i>	Date:	Time:	Received by: (Signature) <i>[Signature]</i>	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank Temperature **28°** °C

ALS Environmental Sample Acceptance Check Form

Client: Tetra Tech, Incorporated

Work order: P1501359

Project: West Lake Landfill / 103X9025140058

Sample(s) received on: 4/3/15

Date opened: 4/3/15

by: KKELPE

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were sample containers properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Container(s) supplied by ALS ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Did sample containers arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Were chain-of-custody papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Did sample container labels and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Was sample volume received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Was proper temperature (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Cooler Temperature: 28° C Blank Temperature: ° C			
	Gel Packs			
9	Was a blank tube received?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Were custody seals on outside of cooler/Box?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Location of seal(s)? _____ Sealing Lid?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Were signature and date included?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Were seals intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11	Do containers have appropriate preservation , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Is there a client indication that the submitted samples are pH preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were VOA vials checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12	Tubes: Are the tubes capped and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Do they contain moisture?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	Badges: Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1501359-001.01	Passive (Radiello H2S)					
P1501359-002.01	Passive (Radiello H2S)					
P1501359-003.01	Passive (Radiello H2S)					

Explain any discrepancies: (include lab sample ID numbers): _____

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1501359

Hydrogen Sulfide

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date(s) Collected: 3/27/15
Date Received: 4/3/15
Date Extracted: 4/8/15
Date Analyzed: 4/8/15
Desorption Volume: 0.010 Liter(s)

Client Sample ID	ALS Sample ID	Sampling		Result ng/Sample	MRL ng/Sample	MDL ng/Sample	Result µg/m³	MRL µg/m³	MDL µg/m³	Data Qualifier
		Time Minutes	Dilution Factor							
WAA-04-RH-PS-20150327	P1501359-001	10046	1.0	120	570	110	0.21	1.0	0.19	J
WAA-04-RH-DU-20150327	P1501359-002	10046	1.0	120	570	110	0.21	1.0	0.19	J
WAA-00-RH-TB-20150327	P1501359-003	NA	1.0	ND	570	110	NA	NA	NA	
Method Blank	P150408-MB	NA	1.0	ND	570	110	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

NA = Not applicable.

HVG
20 April 2015

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Page 1 of 1

Client: Tetra Tech, Incorporated
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: West Lake Landfill / 103X9025140058

ALS Project ID: P1501359
ALS Sample ID: P150408-LCS,
P150408-DLCS

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary

Test Code: ALS AQL 110
Instrument ID: P-UV-Vis-01
Analyst: Sue Anderson
Sampling Media: Radiello Tube(s)
Test Notes:

Date Sampled: NA
Date Received: NA
Date Analyzed: 4/08/15
Volume(s) Analyzed: NA

Compound	Spike Amount	Result		% Recovery		ALS Acceptance Limits	Relative Percent Difference	RPD Limit	Data Qualifier
	LCS / DLCS µg/L	LCS µg/L	DLCS µg/L	LCS	DLCS				
Hydrogen Sulfide	500	502	499	100	100	73-129	0	5	



2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Hydrogen Sulfide (H₂S) in Air Bench Sheet

ALS AQL 110

1501192

PT501359

Prep Run #: 233255

Run #: 439775

	Ref #	Concentration (ug/L)	Exp. Date
RAD 171 Stock	524-09/15/14	57250 ug/L	9/2/15
Sulfide ICV/CCV	524-04/01/15 01	500.425 ug/L	4/1/14

Reagents	Reference or Lot #	Exp. Date	Coloring Solution
Ferric Chloride	524-0625/14 02	6/25/15	10 mL Ferric Cl + 50
Amino Sulfuric	524-03/12/15 02	4/12/15	mL Amino Sulfuric
radiello Tube	14315	09/15	prepped prior to coloring step

Calibration Curve: RAD 171 diluted to volume with Deionized Water

10 mL aliquot of each Prep run	NA	0.05 / 50	0.10 / 50	0.20 / 50	0.50 / 50	0.75 / 50	1.0 / 50	Corr. Coeff			
ug/L (ppb)	0	57.3	115	229	573	859	1145	0.99935305			
Abs. @ 665 nm	0.000	0.058	0.124	0.246	0.585	0.872	1.169				
Temp. Corrected											
Sample ID	Sampling Time (mins)	Temp	Extract Volume (L)	Dilution	Blank Subtract Abs.	Absorbance @ 665 nm	Corrected Abs.*	Result ug/L (ppb)	Result ng/sample	Result H ₂ S ppbV**	Result ug/m ³ ***
ICV	—	—	—	—	—	0.000	0.000	-4.15/411.6			
ICV 500 ug/L	—	—	—	—	—	0.550	0.550	537			1070
MB1	—	25°C	0.010	—	—	0.005	0.005	0.77/411.6	L110		
MB2	—	—	—	—	—	0.005	0.005	0.77/411.6	L110		
LCS 500 ug/L	—	—	—	—	0.005	0.547	0.542	524.57 501.96	5020		1000
DLCS J	—	—	—	—	0.005	0.544	0.539	526.2 499.16	4992		1000
P1501192-1.0/	10074	11.10°C	—	—	0.005	0.025	0.020	15.543	147.323	0.18	0.25
J -2.0/	10074	J	—	—	0.005	0.025	0.020	15.543	147.323	0.18	0.25
J -3.0/	0	NA	—	—	0.005	0.006	0.001	-3.17/411.6	L110		
P1501359-1.0/	10046	9.40°C	—	—	0.005	0.022	0.017	12.588	119.321	0.15	0.21
J -2.0/	10046	9.40°C	—	—	0.005	0.022	0.017	12.588	119.321	0.15	0.21
J -3.0/	0	NA	—	—	0.005	0.006	0.001	-3.17/411.6	L110		
CCV 500 ug/L	—	—	—	—	—	0.550	0.550	537			1070
CCV1	—	—	—	—	—	0.000	0.000	-4.15/411.6			

*Concentration after blank subtraction (as applicable)

Comments: **H₂S in ppbV = ng H₂S / (0.096 ng/ppb · min) x time in minutes; ***ug/m³ = ppbV H₂S x (34.09 MW of H₂S / 24.46 gas constant)

LCS (500 ug/L): spike tube with 0.5 ml of freshly prepped 10 ppm sulfide solution [0.0764g Sodium Sulfide up to 1L with DI] up to 10 mL desorb volume

Prepped By: SKK

Analyzed By: SKK

Reviewed By: SKK

Date: 4/8/15 @ 1130

Date: 4/8/15 @ 1300

Date: 4/9/15

TEMP CORRECTION = (K/298)

Apply to R

SAN JUAN DATE

ICV/CCV Acceptance Criteria: 90 -110%
LCS/DLCS Acceptance Criteria: 73 - 129%
RPD Acceptance Criteria: ≤5%

...slightly than what is reported due to sig figs used for calculation.

6/25/14 S24-06251401 1:1 H₂SO₄
 250ml conc H₂SO₄ (EMD 49284; EXP: 11/20/14) +
 250 ml DI H₂O
 EXP: 11/20/14

6/25/14 S24-06251402 Ferric Chloride Soln
 100g FeCl₃ · 6H₂O (Mallinckrodt J13631;
 EXPI: 9/25/15)
 EXP: 6/25/15

6/25/14 S24-06251403 Sulfanilamide Soln
 5.00g Sulfanilamide (JT Baker lot J32618; EXP 11/6/11)
 DISSOLVED IN 50ml conc HCl (EMP lot # 49200;
 EXP: 2/7/16) ↑ 500ml w/ DI H₂O
 EXP: 6/25/15

6/25/14 S24-06251404 AMINE Soln
 SLOWLY ADD 6.25ml conc H₂SO₄ (EMD 49284;
 EXP: 11/20/14) TO 2.5ml DI. EtOH.
 DISSOLVE 1.6875g N,N-dimethyl-1,4-phenylene
 diamine oxalat (ALDRICH MCR57841V; EXP:
 5/24/16) IN ABOVE ACID Soln then dilute
 to 250 ml w/ 1:1 H₂SO₄ (S24-06251401;
 EXP: 11/20/14).
 EXP: 0725/14

9/8/14 SZ4-0908/401 0.1 N H₂SO₄
 5.6 ml conc. H₂SO₄ (EMD 49284; EXP: 11/20/14)
 ↑ 2L w/ DI H₂O
 EXP: 11/20/14

9/8/14 SZ4-0908/402 1.0 N NaOH
 8.0 g NaOH (EMD B0630569 12/13) ↑ 200 ml
 w/ DI H₂O
 EXP: 9/8/15

9/15/14 SZ4-0915/401 H₂S radiello stock
 Purchased Sigma Aldrich
 RAD 171 100 ml Amber GLASS
 LOT # 14279102 CAT # RAD 171
 Prepped 1:50 ⇒ 1.145 µg/ml Sulfide
 EXP: 9/2/15

Calibration solution for Hydrogen Sulphide (code RAD171)

CAUTION: Do not swallow. Wash the hands thoroughly after use. Avoid contact with the eyes, skin and clothes. In case of contact with eyes, flush with large amounts of running water for at least 15 minutes. See MSDS for complete safety information.

Description

Code RAD171 relieves you from the task of preparing the sodium sulfide standard solution for the calibration curve used for the determination of H₂S by the cartridge code RAD170. Since sodium sulfide is deliquescent, its weight is not a primary standard and sodium sulfide solution need titration once prepared. Moreover, titration must be repeated often due to the instability of diluted solution (one hour time is sufficient to decrease sulfide content by 10%). Code RAD171 is a methylene blue concentrated solution that, once diluted 1:50, provides the same absorbance value at 665 nm of a sodium sulfide solution of with concentration 1.145 µg·ml⁻¹ sulfide ions. This concentration value has been chosen to obtain the highest absorbance value within the linearity range of the spectrophotometer. To obtain a complete calibration curve, just dilute the mother solution as shown in the table.

Solution	ml of	ml of water	equivalent to µg·ml ⁻¹ of S ²⁻
A	2 of code RAD171	98	1.145
B	25 of A	25	0.572
C	10 of A	40	0.229
D	5 of A	45	0.115

Code RAD171 allows you to prepare as many as 50 calibration curves.

Storage

Store in original containers or other appropriately labeled, suitable containers. Kept in a cool, dry environment away from sources of heat code RAD171 solution is stable for at least one year.

3/12/15 S24-03121502 AMINE SOLN
 slowly ADD 6.25ml Conc H_2SO_4 (EMD 54174, EXP: 11/7/19)
 to 2.5ml DI H_2O . let cool.
 Dissolve 1.6815g N,N-Dimethyl-1,4-phenylenediamine
 oxalate (Aldrich MKBG 8041V EXP 5/24/16)
 then DILUTE to 250 ml w/ 1:1 H_2SO_4 (S24-0312
 1501).

EXP: 4/12/15

3/18/15 S24-03181501
 0.1N H_2SO_4
 5.6ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
 ↑ 2 L w/ DI H_2O
 EXP: 3/18/16

3/26/15 S24-03261501 500ppm NO₂
 Purchased
 RICCA Chem Company Cat No 54445-4
 lot # 1503052
 EXP 9/15/15

3/26/15 S24-03261502 0.1N H_2SO_4
 5.6 ml Conc H_2SO_4 (EMD 54174; EXP: 11/7/19)
 ↑ 2 L w/ DI H_2O
 EXP: 3/26/15

3/26/15 524-03261503 1000 NH₃ Stock
 In 0.3741g NH₄Cl (END WJ11C; EXP: 6/5/19) ↑
 100ml w/ 524-03261502).
 EXP: 9/26/15

4/1/15 524-04011501 Methyline Blue 1% Soln
 100ml plastic purchase 56A024
 Alfa Aesar LOT #
 EXP: 4/1/16

4/1/15 524-04011502 0.1 N H₂SO₄
 5.6ml Conc H₂SO₄ (END 54174; EXP: 11/7/17)
 ↑ 2L w/ DI H₂O
 EXP: 3/5/16 4/1/16
 4/1/15